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THE text of the commercial treaty upon which the United States and Mexico have agreed has been published. The schedule of articles of American manufacture which the Mexican government will admit free of duty includes almost all the materials, machinery, and supplies needed in mining and metallurgical operations, for farming and the railroads.

THE Senate has passed its little tariff bill without materially changing the duties provided in its schedules as first adopted, and the country is now in a gentle state of excitement to know what the result of the dickering of the various factions in the House will be. The principal difficulty now seems to be to get the bill before a conference committee.

OWING to an unfortunate mutilation in the printer's hands of the manuscript of our article on the Boss continuous system, the tailings from the Sierra Grande mill were made a little too rich to be allowed to be neglected, and we unnecessarily exaggerated a trouble that has been puzzling the engineers connected with that company. Even they can not afford to have 23 per cent of silver in the tailings. It ought to have read *silica*.

WE print elsewhere a full report of the proceedings of the Boston Meeting of the American Institute of Mining Engineers, including all but the final session. The attendance was large, and the papers presented were of considerable interest. The excursions were very well planned throughout, and were very well attended, the other attractions of a city like Boston causing less scattering than is occasionally noticed at the winter meetings.

MR. J. S. JEANS, Secretary of the British Iron Trade Association, has just issued a statement of the statistics of production of pig-iron and the stocks in Great Britain. According to his figures, the output reached the enormous total of 8,493,287 gross tons, the Cleveland District leading with 2,688,650 tons, Scotland following with 1,126,000 tons, and the West Cumberland hematite district with 1,001,181 tons. Restriction in the Cleveland and Scotch districts reduced the stocks during the year in those sections by 215,991 tons; but an increased make in a large number of other districts made up for part of the decrease, bringing the stocks at the close of last year up to 1,576,894 tons, against 1,736,262 tons on the 31st December, 1881.

THE rapid succession of failures and embarrassments in the iron trade and the general apathy in that great industry have caused an erroneous impression to go abroad. It is believed by many that the business is on an unsound basis, and that the troubles referred to are only the forerunners of general and widespread financial disaster. While we fully acknowledge that iron-masters are in some cases only holding their own, and in many others are reaping only small profits, compared with former years, we must very energetically protest against any such pessimistic views as those to which we have alluded. It would be tedious to go into details, but it can, we believe, be shown that the embarrassments of the last month are due to special causes, aggravated, of course, by the prevailing dullness of trade. Over-speculation, mismanagement, unfavorable location, etc., have been the principal causes of these local failures. They are not characteristic of the iron trade. They can not be considered as a deep-rooted disease, of which the happenings of the past few months are only the outgrowth. The stagnation in the trade is largely artificial and temporary. For fully a year, buyers have been sailing closely to the wind, and when the tariff agitation was intensified by the interminable and ill-directed discussion in Congress, they were positively frightened out of the market. On the other hand, the production, which otherwise would have been very great, was checked by labor troubles in many sections in the country, and stocks are consequently low in the hands of producers, middlemen, and consumers. Any impetus to trade which the generally favorable situation of business in the country would easily furnish would therefore have an exceptionally powerful influence under the circumstances, and there are those who feel warranted in dreading an undue activity that might lead to a repetition on a smaller scale of the unfortunate boom period.

THE Census Bureau has published a summary of what promises to become one of the most interesting monographs in the series. The statistics of the traffic and fiscal operations of the railroads of the United States have never been so fully collected and so clearly presented. Much of the success of the Census Bureau in accomplishing this work is of course due to its exceptional facilitities, the absence of which no industry or enterprise on the part of those who have attempted to present similar figures could outweigh. But even with such advantages, the work has required a high degree of diligence and of thorough familiarity with the subject. According to the data submitted, there were at the close of the census year ended June 30th, 1880, 87,891·35 miles of finished railroad in the United States, the construction of which cost $4,112,367,276. The equipment cost $418,045,458, the value of the lands was $103,319,845, the value of telegraph lines and miscellaneous improvements was $204,913,196, while the stock and bonds issued by other lines held by railroads was $343,800,131, making the total of permanent investments $5,182,445,806. In addition to these, the railroads had cash assets footing up to $353,973,981, and profit and loss to credit of $110,697,228, the total assets being $5,536,419,787. The total capital paid in and borrowed is $5,425,722,560, including $2,613,606,264 capital stock paid in, $2,390,915,402 funded debt and $421,200,894 unfunded debt, the latter including $68,750,288 interest unpaid and $13,059,983 dividends. From total transportation earnings of $580,450,594, swelled to $661,295,392 by income from other sources, expenditures of all kinds footing up to $541,950,795, including $352,800,121 for transportation, must be deducted, leaving a net profit of $119,344,597, out of which $70,550,342 of dividends were declared. The general average earnings upon the stock of all the companies were only 4·566 per cent, and only 2·699 per cent of dividends were paid; 623 companies, representing 80 per cent of the aggregate stock of the country, were operated at an average profit of 6·23 per cent. A part of the rest made a deficit, and another part was still under construction.

The itemized statement of the transportation expenses of the railroads is particularly interesting, because it gives some idea how valuable customers they are to many industries. Among the heaviest expenses we find the following: Repairs of road-bed and track, $39,603,076, or 11·23 per cent of the total; renewal of rails, $17,243,950, or 4·89 per cent; renewal of ties, $10,741,577, or 3·04 per cent; repairs of bridges, $9,009,097, or 2·55 per cent; repairs of locomotives, $21,830,963, or 6·19 per cent; repairs of passenger and baggage-cars, $10,558,824, or 2·99 per cent; and repairs of freight-cars, $22,595,533, or 6·40 per cent—the aggregate of the cost of maintaining road and rolling stock being nearly one

half of the whole transportation expenses. One of the heaviest items of the operating and miscellaneous expenses is the fuel for locomotives, being $32,836,470, or 9·31 per cent.

The railroads of the United States transported 290,897,395 tons of freight, hauling it on an average 112 miles, at a cost of 0·76 cent per ton per mile, while they carried 269,583,340 passengers, on an average of 23 miles, at a cost of 1·71 cents.

CORRESPONDENCE.

[Communications will be noticed only when accompanied with the full name and address of the writer. Unless specially desired, only initials will be printed. We invite criticism and comment by the readers of the ENGINEERING AND MINING JOURNAL. Replies not intended for publication should be addressed to the Editor of the ENGINEERING AND MINING JOURNAL in blank, stamped, and sealed envelopes.]

The Report of the California State Mineralogist.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In reply to correspondence forwarded to me by you, I will state that the report is for gratuitous distribution, and that all applications for it have been honored, without favor. Out of 2000 copies, less than 100 remain, all of which will be disposed of before you receive this. There is a bill before the State Legislature to reprint 5000 copies; but I have but little hope of its passage, owing to the short term and unusual press of bills. Should, however, the appropriation be made, certain crudities, noticed in your review, will be corrected, and the work carefully revised.

Very respectfully, HENRY G. HANKS, State Mineralogist.

SAN FRANCISCO, CAL., Feb. 15, 1883.

Assaying in Our Mining Schools.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: I note in your issue of January 20th an article entitled "Suggestions to Young Assayers," signed by E. D. Peters, Jr., who makes some statements which, although in the main true, will not hold good in all cases. He speaks of students making two or three scorifications during the day, and being found wanting when they enter practical life, and of making "sixty assays" before dinner. He does not state how many furnaces are needed for this, but I assume that he means only one. For accurate work, such an output is impossible. I speak whereof I know, having been student and instructor in assaying, and also manager of various mines, with young graduates under me. In the best mining schools in this country, students are required to build their own fires, make their own cupels, and brasque their own crucibles; and last, but not least, no student leaves a reputable school of mines with a diploma, ignorant of the adjustments of his balance.

Mr. Peters also refers to the "crucible assay" as something new or unusual. Let me ask him to step into the assay laboratory of almost any of our mining schools, and he will find that operation in full blast.

He speaks of the assayer granulating his own lead. This is well enough if he chooses to do so, but I prefer to buy. I have a very unpleasant remembrance of this operation in Idaho territory a few years ago.

I can indorse his statement as to recent graduates to a certain extent; they, like new employés in other lines, have to learn the ways of their superiors; but my experience, extending through some years, has taught me that the recent graduate, though perhaps slow, is more accurate in his work than the older one. He often strains at a gnat and gives birth to a camel.

Mr. Peters is evidently not familiar with American mining schools, else he would not write as he does. He has probably been led into the not uncommon error of judging our graduates by the host of self-constituted assayers that abound in our Western territories.

NELSON W. PERRY, E.M.,
Supt. and Eng. N. Y. M. M Co.

PIÑOS, ZACATECAS, MEXICO, Feb. 7, 1883.

THE BOSTON MEETING OF THE AMERICAN INSTITUTE OF MINING ENGINEERS.

The annual meeting of the American Institute of Mining Engineers was opened with a session on Tuesday evening, February 20th, in one of the parlors of the Brunswick Hotel, Boston, a large number of members, among them the following gentlemen, being present. During the course of the meeting and the excursions, many others joined the party with their ladies:

Prof. Alexander Agassiz, John S. Alexander, W. Lawrence Austin, Richard D. Baker, James C. Bayles, William F. Biddle, Prof. W. P. Blake, George W. Bramwell, William Burnham, F. von A. Cabeen, R. C. Canby, S. H. Chauvenet, Townsend V. Church, Charles E. Coffin, C. Constable, Frederick H. Daniels, Dr. Thomas M. Drown, S. F. Emmons, W. E. C. Eustis, J. W. Farquhar, E. L. Ford, Robert Forsyth, Dr. Persifor Frazer, John Fritz, Albert F. Hill, Henry M. Howe, Robert W. Hunt, Dr. T. Sterry Hunt, Charles Kirchhoff, Jr., Wheaton B. Kunhardt, L. G. Laureau, E. D. Leavitt, Jr., Samuel W. Lewis, Walter McDermott, W. F. Mattes, George W. Maynard, Philip W. Moen, J. H. Paddock, R. W. Raymond, Ellen H. Richards, Prof. R. H. Richards, J. H. Ricketson, Percival Roberts, Jr., R. P. Rothwell, Henry H. Sawyer, Oliver P. Scaife, S. P. Sharples, John M. Sherrerd, Porter W. Shimer, J. William Smith, Herbert G. Torrey, S. T. Wellman, William H. Wiley.

THE FIRST SESSION.

The proceedings began with a thoughtful address of welcome by Mr. Edward Atkinson, who is the acknowledged leader and representative of large manufacturing interests in the Eastern States. Mr. Atkinson, after briefly touching upon the relations of agriculture and mining and metallurgical interests, dwelt upon the fact, that while Massachusetts was once the seat of an important iron industry, it now occupied a very low rank in the list of producing States. He referred to the manufacture of iron from bog ores at Saugus and Braintree, those being among the first efforts made in America toward the utilization of her mineral deposits. He alluded to the fact that the dies for coining the pine-tree shillings were made at home, and pointed out that the descendants of Revere, the coppersmith, whose deeds historians have recorded, built up a great copper industry until what he called the destructive interference of the statute laws of the country deprived them of their supplies and closed their works in Boston harbor. He urged with much enthusiasm and ingenuity that, with all the advantages which this country possessed in natural resources, extensive and valuable beds of coal, great and accessible deposits of pure ores, it was being steadily placed at a greater disadvantage. The high duties on crude and finished materials were placing New England at a greater disadvantage when compared with other sections, and were protecting the machine shops and ship-yards of Great Britain against a formidable rival. The achievements of our engineers, the enterprise, skill, and ingenuity which they have displayed, prove that they have nothing to fear from the rivalry of those of other countries; and the superior intelligence, skill, and industry of our labor places it in a position where it need not dread the competition of "pauper" labor. He spoke earnestly against the false fundamental assumption that pauper labor is cheap labor. Mr. Atkinson's free-trade argument was listened to with the closest attention, though probably few in his audience shared his convictions. It was an earnest and eloquent speech by a gentleman whose opinions are entitled to respect, not alone for his individual work, but also because he is the representative of important interests.

Mr. Atkinson was followed by Mr. Thomas Doane, President of the Boston Society of Civil Engineers, who, in a humorous speech, frequently interrupted by applause, welcomed the Institute. After a brief response by the President, Mr. R. P. Rothwell, the business of the meeting was formally opened, Mr. James C. Bayles, editor of the *Iron Age*, reading an elaborate paper on the Microscopic Analysis of the Structure of Iron and Steel. Speaking of the importance of this line of investigation, now beginning to attract the attention which it deserves, Mr. Bayles says that, with only the laboratory and the testing-machine, the investigation of the structure and properties of steel moves in parallel lines, leaving between them unexplored fields. In them must probably be sought the information which shall connect the results of chemical and physical tests, and give to both a practical value which neither has yet been found to possess.

Among the recent contributors to the literature of the microscopical study of the structure of iron and steel is Herr A. Martens, of Berlin, whose results are recorded in a paper printed in the transactions of the *Verein zur Befoerderung des Gewerbfleisses*. Herr Martens claims to be confident that microscopical analysis will find a place as a rival of chemical analysis, though he acknowledges that, so far, he has not been able to obtain results which he would consider conclusive. He has used a microscope of special construction, and has devoted much attention to the preparation of specimens, the surfaces having been ground and finely polished, and then treated with acids so as to clearly develop the crystals and fibers in the metal. This preparation is said to require no great degree of skill. Martens, in the course of his investigations, found that the fractured surfaces of bars which broke under repeated use exhibited distinct features, clearly-defined portions of ellipses in some steels, and within each portion of them streaks, the prolongation of which beyond the ellipses ran in directions normal to the bounding surfaces of the broken pieces. He thinks that conclusions as to the use to which pig-iron and steel may be put may, in a great number of instances, be based upon examinations of this kind, and that the method will very often be found sufficiently trustworthy for all practical purposes.

Another valuable contribution to the literature of this subject was recently made by Dr. H. C. Sorby, of Sheffield, who prepared his specimens with weak acid. Dr. Sorby found that some of the constituents of the specimens are not acted upon at all by the acid, and others in varying degree. Thus some show the outlines of individual crystals very perfectly, while others develop a very close grooved structure, giving colors of varying brilliancy. The thorough determination of the exact nature of all the constituents seen in the various specimens would involve many years of careful chemical and microscopical investigation, since, though many of them differ very greatly in microscopical and physical character, their size is so small that it would be difficult or impossible to separate them in such a manner as to determine their chemical constitution. It would consequently be requisite to ascertain their true nature by careful induction from facts observed under special circumstances. Dr. Sorby has found various kinds of iron and steel to contain at least seven well-marked constituents, and has examined a large number of specimens with very interesting results.

Mr. Bayles then elaborately reviewed the conditions of success in the employment of the microscope in the examination of iron and steel. It requires a careful and thorough training of the eye, the proper preparation of the specimens, a correct choice of instruments and an inexhaustible fund of patience.

Dr. T. Sterry Hunt was then called upon for his paper on Coal and Iron in Alabama. Dr. Hunt described some of the more remarkable points in the geology of the coal region of Central Alabama, and showed the intimate and peculiar relations, both of the geology and geography of the region, to its economic interests. Dr. Hunt holds that the development in Central Alabama not only of a great coal trade, but of a vast iron industry, is certain in the near future, and has already begun. Dr. Hunt's general review of the geographical position of Alabama, and its mineral wealth, is of so much interest that we hope to give his paper in full in an early issue. The paper was briefly discussed by Mr. Rothwell, to whose earlier work in the same field Dr. Hunt repeatedly referred. Mr. Rothwell, in closing his remarks, called the attention of the Institute to the great services which the pioneer of that section of the country, Mr. Joseph Squire, of Helena, had rendered in studying and developing its mineral deposits.

After the election of a large number of members and associates, proving how much the Institute continues to thrive, the meeting adjourned.

THE SECOND SESSION.

The second session of the Institute was held in one of the rooms of the Massachusetts Institute of Technology, and was opened with a paper by Professor Richards, on the peculiarities of a block of tin obtained by smelting the residuum after distilling the amalgam. The block tin, after remaining quiet for a time, changed its surface entirely, crystalline spots appearing upon it. The tin held from 2·62 to 2·72 per cent of mercury. Dr. Hunt, during the discussion, referred to the molecular changes due to excessive cold, independent of impurities.

This was followed by Mr. H. W. Howe on a Suggested Cure for Blast-Furnace Chills."

Quite a lively discussion sprang up upon the subject presented; Messrs. Mattes, of Scranton, Constable, Rothwell, and Raymond taking part.

Prof. W. P. Blake, of New Haven, presented a summary of a paper on the metallurgy of nickel, in which he reviewed the history of the metal and its employment in the arts, the nature of the deposits in this country and abroad. He then went in detail into the manufacture and use of malleable nickel, referring at length to the work of Dr. Fleitman, and calling attention to the fact that Mr. Joseph Wharton, of Philadelphia, had for a number of years achieved a great deal in this way, and was now further developing it. Professor Blake had with him a very interesting series of specimens of sheets, bars, hollow ware, etc.

Mr. G. W. Maynard then introduced Mr. A. S. Bower, C.E., of St. Noets, England, who read the following paper:

THE BOWER-BARFF PROCESS.

Any process which has for its object the preservation of iron and steel from rust, and which will make these metals more applicable than they now are to the requirements of mankind, will be sure to meet with attention from members of this Institute, and from all those who are either engaged in the extraction of the ore, its reduction to metal, or the subsequent application of the metal itself.

It is, perhaps, not too much to say that, with iron and steel rendered secure against corrosion and decay, they will be used to an indefinitely greater extent than they now are. The whole realm of science has therefore been explored in the attempt to discover some method by which the formed article may be preserved, leaving its strength undiminished by the destructive action of rust. Paints, oils, varnishes, glazes, enamels, galvanizing, electro-depositing, and what is called "inoxidizing" are among the many systems now in vogue to effect the preservation of iron and steel from the corrosive action of air and water. The object of this paper is to show what may be done in protecting iron and steel from rust by forming upon their surface a film of magnetic oxide by an inexpensive process. It is no new thing to be told that magnetic oxide of iron is unaffected by exposure to the atmosphere or to salt water for any length of time. The black sand of Taranaki in New Zealand is a sufficiently good example of this. Dr. Percy has pointed out that the reason why Russian sheet-iron is less affected by exposure than ordinary sheet-iron is because of a coating of magnetic oxide; but this was not known until Dr. Percy discovered it. That such a coating is produced is quite certain, but it is only an accident of manufacture. To Professor Barff is due the credit of being the first to deliberately undertake to coat iron and steel with magnetic oxide, produced designedly for the purpose of protecting their surfaces from rust. Some sixteen or seventeen years ago, my father was making a series of experiments in the production of heating gases, one set of them being the decomposition of water by passing superheated steam through masses of red-hot iron. He noticed that the iron became less and less active until it ceased to decompose at all, when, on examining it, he saw that it was coated with a kind of enamel. It at once occurred to him, on seeing this, that the process in question might be used to obtain such a coating; but he found, after a few days' exposure of the iron to the atmosphere, that the coating shelled off, and he pursued the matter no farther. The iron employed in this case was rusty; but if it had been new, my father would in all human probability have been the accidental author of the process which Professor Barff discovered ten years afterward. I only mention this to show how advisable it is to investigate the causes of unexpected effects. Professor Barff's process consists in subjecting iron or steel articles to the action of superheated steam; and when they are at a temperature sufficiently high, three equivalents of iron combine with four of oxygen, forming one equivalent of magnetic oxide and setting eight of hydrogen free, or symbolically (1), $Fe_3+4(H_2O)=Fe_3O_4+8H$. Upon reading a description of the Barff process in the London *Times*, it occurred to my father that what the professor could effect with steam, he might also effect with air, and several experiments were made to this end, which, however, were very varied in character, as also were they in the results obtained. The first was made with cast-iron by placing the articles to be treated in a cast-iron retort heated externally, and then passing superheated air over them, and it was successful, while nearly all others afterward were quite the reverse, as sesquioxide was copiously produced as well as the magnetic. Another experiment was made by placing a bar of polished cast-iron in the main duct of superheated air to a blast-furnace, and this, though covered with a red sesquioxide powder and easily brushed off, had a thin but very firm and tenacious coating of magnetic oxide in contact with the iron. This bar has been exposed to the weather ever since, or over four years, without the slightest appearance of rust. Ultimately, when thinking over the fact that air is oxygen and nitrogen in mechanical combination only, I came to the conclusion that, to form the lower or magnetic oxide, the quantity of free oxygen and so of the air employed, must bear some proportion to the surface of the articles exposed to its action, more especially when a comparatively low heat is employed. This is so, and it has been proved that the quantity of air passed through the retort during most of the unsuccessful experiments was three or four hundred times more than was actually necessary. The reasons also why the first experiment was successful were, that a great number of articles were in the muffle, that a very high heat was employed, and that the retort had been previously used for coal-gas making, and had a deposit of carbon in it, which to a great extent neutralized the effect of the large excess of air.

All the unsuccessfully treated articles were red with sesquioxide outside; but there was nevertheless a coating of magnetic oxide in close proximity with the iron, due to the reducing influence of the metal in contact with the sesquioxide at an elevated temperature. The general appearance, however, of iron so treated was disagreeable, to say the least of it. The mode of action I then adopted was to admit a few cubic feet of air into the retort at the commencement of every half-hour, and then to leave the iron and air to their own devices, the retort of course being tightly closed. During each half-hour, a coating of magnetic oxide was formed, and the operation was repeated as often as was considered necessary.

Effective as this was for cast-iron, the cost of producing the coating was as great as by the Barff process; for both of them required that the chamber should be heated externally, and this, with large furnaces, is very expensive. Another plan that I adopted was to first find out approximately the extent of the surface of the goods to be treated, by first dipping them all into a tank of water of known area, lifting them out, and noticing the amount of water taken out of the tank by the wetted surface, and regulating accordingly a slow continuous air supply by meter, of course keeping the temperature of the muffle as nearly constant as possible. This, too, was successful; but the same objections applied to that mode of procedure as to the other.

There was commenced a series of experiments with carbonic acid, chemically produced by the decomposition of chalk, the idea being that three equivalents of iron would unite with four of carbonic acid, forming one equivalent of magnetic oxide, and four of carbonic oxide, if the heat were sufficiently high. This reaction is expressed symbolically thus: (2) $3Fe+4(CO_2)=Fe_3O_4+4(CO)$. This is the simplest action that could take place; but it was evident, from the results, that something quite different was obtained, inasmuch as the coating was very light in color, pleasing to the eye, but easily removed, and in that sense entirely differing from the articles you see before you. This coating, from effects exactly similar and designedly produced by a studied manipulation in the furnaces in successful operation in England, France, and here, proves pretty conclusively that carbonic acid, practically pure, produces upon iron, at an elevated temperature, a film which is, in composition, a mixture of FeO and Fe_3O_4, or, at all events, it is nearer the metallic state than is magnetic oxide. But even supposing that the results obtained by the carbonic acid had been successful as then carried out, the objections referred to concerning the air process would still exist, as external heat and a closed iron muffle would always be necessary. I therefore proposed to use a fuel-gas producer, similar in principle to the Siemens generator, but altered practically to suit other requirements, to burn the combustible gases thus produced with a slight excess of air over and above that actually required for perfect combustion, and to heat and oxidize the iron articles placed in a suitable brick chamber by these products of combustion. I also arranged a continuous regenerator of fire-clay tubes underneath the furnace, so that the products of combustion leaving the oxidizing-chamber passed outside the tubes, imparting a portion of the waste heat to them, which was taken up by the ingoing cold air passing through their interior on its way to the combustion-chamber. I had hoped in this way to be able to so regulate the excess of air over that required for complete combustion as to be able to produce magnetic oxide directly, instead of the lower and useless oxide or combination of oxides produced by carbonic acid alone. I obtained some beautiful results, and some again were unaccountably bad, and I soon found that it was as difficult to regulate the precise amount of oxidation as it first was in the Bessemer process, and I was fortunate enough to hit upon an almost parallel remedy, that is to say, I increased the quantity of free oxygen mixed with the products of combustion, and oxidized the iron articles to excess during a fixed period of generally forty minutes, when magnetic oxide was formed close to the iron and sesquioxide over all. Then for twenty minutes I closed the air inlet entirely, leaving the gas-valve open, and so reduced the outside coating of sesquioxide to magnetic oxide by the reducing action of the combustible gases alone. The excess of oxygen in the first instance produces Fe_2O_3 or sesquioxide of iron; and the under surface of this, being in contact with metallic iron, undergoes reduction to magnetic oxide in the following manner: four equivalents of sesquioxide unite with one of metallic iron, forming three equivalents of magnetic oxide, or symbolically (3) $4(Fe_2O_3)+Fe=3(Fe_3O_4)$.

When deoxidizing by combustible gases, consisting mainly of carbonic oxide, three equivalents of sesquioxide unite with one of carbonic oxide and form two equivalents of magnetic oxide and one of carbonic acid and symbolically (4) $3(Fe_2O_3)+CO=2(Fe_3O_4+CO_2$. Another method of reduction is by carbon itself, when the formula stands thus: (5) $3(Fe_2O_3)+C=2(Fe_3O_4)+CO$.

Formula (4) is also the reaction when rusty iron is reduced by producer gases, which consists largely of carbonic oxide, and by the specimens exhibited it will be seen that articles completely pitted with rust may have their surfaces rendered rustless. In this case, the periods of oxidizing and deoxidizing are reversed, that is to say, the latter occupies forty and the former twenty minutes. No oxidizing is theoretically necessary, but practically a certain amount is requisite to keep up the heat in the chamber, which of course could not be done unless combustion took place some time or other. I only mention the reduction by carbon as exemplified by formula No. 5 because, while experimenting with a furnace, I was asked by the proprietors of a valuable red oxide deposit which was found in so finely divided a state as to be capable of being used at once as a paint, whether I could reduce it to a magnetic oxide. I tried to do so by carbonic oxide; but I found that only the surface of it was affected, and that even this, when taken out of the furnace, speedily returned to its original red color by the combined actions of the unconverted material underneath and the air above. It will be found from formula (5) that $2\frac{1}{2}$ pounds of carbon are required to reduce 100 pounds of red oxide. This I mixed intimately in the shape of powder with the red oxide, brought the mixture to a red heat, and the result was black magnetic oxide. Not only this, but by adding more carbon I could make the color lighter and lighter until it was almost identical with the coating produced in my previous experiments with carbonic acid, and by reducing the quantity of carbon below $2\frac{1}{2}$ per cent, various shades of purple were obtained, the red appearing more and more prominent as the quantity of carbon was diminished. It will be as well, before I make any comparison between Professor Barff's process and those patented by my father and myself, to state that the whole of the professor's patents, wherever existing, have been purchased by my father, so that in this case, at least, I hope you will not say that "comparisons are odious." Professor Barff's process is better than ours for wrought-iron and perhaps for polished work of all kinds, as iron commences to decompose steam at a very low temperature, in fact, much below visible redness. Only the other day, at the annual meeting of the Association of American Stove Manufacturers, held in New York, I was asked whether stove patterns might not be made of cast-iron, polished, and then oxidized. Here is one among many instances where the steam process is almost invaluable. For ordinary cast iron, and especially that quality which contains much carbon, the Barff process is much too slow in its action, and some specimens that I have treated in England have taken as much as thirty-six hours to coat effectually, which could readily have been finished off in five hours by the Bower process. The main distinction between the two is

that the Bower is much more energetic in its action than the Barff process. The carbon in cast-iron impedes oxidation, and so, while cast is far more readily treated in the Bower furnace, wrought-iron is apt to scale unless it is rusted beforehand. The rust then eats into the metallic surface under the influence of heat, and forms a tenacious combination with it. The objection to the use of a closed muffle externally heated in the Barff process has been almost entirely overcome by simply putting wrought-iron into a Bower furnace, previously well heated, then shutting off both the gas and air supplies, and admitting steam into the regenerator tubes. The steam thus passes through the red-hot tubes, then through the combination-chamber and its contingent passages already highly heated, over the articles in the oxidizing-chamber, heating and oxidizing them, and thence over the outside of the regenerator tubes, depositing a great portion of its heat there before passing to the chimney, and which is again picked up by the in-going fresh, cool steam. In this way, the heat in the chamber is highest shortly after the commencement of the operation, and gets gradually lower during the time of exposure, which varies according to the class of goods from five to ten hours. At the close of the operation, just before the articles are taken out, every thing is moderately cool, and this for steam is the perfection of action, as stated by Professor Barff himself. Steel, I consider, can be equally well treated by both processes, and, indeed, it is natural to expect this, steel being, so far as the quantity of carbon it contains is concerned, between cast and wrought-iron. Polished steel, however, is better treated in a low temperature Barff furnace. With regard to the quality of fuel burnt in the gas-producers, a non-coking gas-coal is the best, and Virginian splint has suited very well in this country, and of this about one ton every three days is required for a furnace with an oxidizing-chamber 13 feet long, four feet three inches wide, and four feet three inches high. When a gas-coal is employed, it should be fed through the charging-hoppers just before each deoxidizing operation, when a smoky flame is of great advantage. I have, however, discovered that anthracite can be used as well as a gas-coal by simply allowing petroleum to drop at the rate of one gallon per hour upon the red-hot surface of the coal in one of the gas-producers. This method has been exclusively used in the coating of the articles exhibited in this room at the works of Messrs. Poulson & Eger, architectural engineers, at North Eleventh and Third streets, Brooklyn, E. D., N. Y., to whom I am much indebted, not only for these beautiful castings, but for the constant courtesy and energy they have always exhibited during the erection of their furnaces. At present, they have two erected, one a Bower furnace, of the size before mentioned, and the other a small Barff furnace for the treatment of very delicate or polished articles. These magnetic oxide processes not only protect from rust, but the coating is of such a beautiful color as to render articles ready for the market as soon as they are out of the furnace and cooled. One remarkable feature of them is, that there is no more cost (except in the labor of handling them) in treating 2240 articles, each weighing a pound, than there is in coating a cube of metal weighing a ton; and so penetrating is the process that, no matter how intricate the pattern may be, every crevice—which it would be almost impossible to get at with a paint-brush—is as effectively coated as the plainest surfaces, as will be observed by examining the specimens exhibited in this room. For art purposes, the French gray color, with shades approaching to black, might not always be suitable; but if it should be necessary to use paint on the iron so coated, there is the absolute certainty that it will remain on in the same way as it does on wood or stone, and thus iron may be used for constructive work in a thousand directions in which it has not, up to the present time, been possible on account of its liability to rust, no matter what the coating used to protect it has been. I can give an instructive instance of this. A company in Paris had expended a very large sum over Dodé's inoxidizing process, which process consists in the depositing of a layer of borate of lead on iron or steel, and then gilding, platinizing, or bronzing them, and certainly the articles so treated were exceedingly beautiful to look at; but the iron ultimately rebelled and threw off the coating, so that the shareholders were in a fair way of losing all their capital, when it was suggested to the directors that, if their compositions could be deposited directly upon magnetic oxide, they would conquer the difficulty. They then applied to my father for specimens of coated iron to experiment upon, and they were so satisfied with the result that the company purchased all our European patents except for England, and is carrying on the combined processes on a large scale. It has, besides its furnaces for the Dodé process, 4 large Bower ones, two being 36 feet long by about 6 feet 6 inches wide and 6 feet high, and a Bower-Barff furnace, also of large size. Others, however, are in course of erection. Engineers and manufacturers appear far more ready to apply the processes here and on the continent of Europe than up to the present time they have been in England; but perhaps the reason has been that, so far as Professor Barff's process is concerned, it has only just been shown how large masses can be dealt with, namely, by the use of the Bower furnace; and I can show that for the treatment of underground pipes, wrought-iron sleepers, roofing, and the like, the process can be readily applied, and at a cost much less than that of galvanizing, and it will at the same time be infinitely more durable; while for ornamental cast and wrought-iron, it is scarcely possible to imagine any thing more artistic in color than some of the articles after they have been treated. For ordinary hollow ware for kitchen use, whether of cast or wrought-iron, this process is admirably adapted; and though I have been told that the gray or black color will probably be objectionable, yet I imagine, if it can be shown, as we can do, that the magnetic oxide is more durable, more easily cleaned, and much cheaper than even the common tinted article, a market will soon be created. Any how, the new combined processes are so far developed, and they have been so thoroughly examined by scientific and practical men both here and in Europe (whose testimony to the value and efficacy of them is voluminous), that they have passed from the region of theoretical investigation into that of practical application, and means have been taken for establishing works in different centers in Europe, as will also be done here, for the purpose of coating iron and steel as a trade operation. One firm alone in Scotland, Messrs. Walter Macfarlane & Co., have adopted the process, their output of ornamental castings per *day* exceeding 100 tons! It is intended to apply the processs to cast-iron gas and water-pipes; and as the former have comparatively no pressure to bear, they may be made much lighter than they now are, if rendered incorrodible; while for water, it will be a great advantage to have both the main and service-pipes rendered safe from rust, which not only discolors the water, but forms the nucleus of very troublesome deposits. There is no reason now why wrought-iron or mild steel pipes should not be used for the same purposes, especially for the interior towns of distant countries, where the first cost of the pipes is but small as compared with the cost of carriage. My father has himself used gas and water-pipes where the cost on arrival at their destination has been five times greater than their first cost in England. If, then, light wrought-iron or steel pipes could be used, not weighing one third of those made of cast-iron, and rendered practically indestructible, what an enormous saving will be effected! Again, in the case of railroad sleepers in iron and steel, which are now almost wholly used in Germany, the process is likely to prove of much advantage, so at least I am told by engineers, both in Belgium and in Germany; and if there, why not here? For fountains, railings, and all architectural work, the process is invaluable, and iron may now be used in many instances instead of bronze. It will naturally be asked, what is the cost of the process? I can not do better than answer the question by quoting from the report of Professor Flamache, the engineer-in-chief of the state railroads in Belgium, who was sent over specially to England to report on the process by the Public Works Department of that country. His estimate of cost, after a very careful examination and testing of the process, was 7½ francs per 1000 kilos, or nearly two dollars per ton—at, of course, the Belgian rate of expenses. He also gives the cost of coating a certain extent of surface, but this I consider to be completely valueless, as, for example, I have had a furnace full of 56-pound weights and another time I have had it full of gas-governor tops, the surface in the latter case being perhaps one hundred times more in extent than in the former, while the actual cost of oxidizing would be the same in both cases. He also says that this cost may be reduced, as instead, of one workman attending to one furnace, he can attend to three or four; also by a better system of taking the articles out than existed in the experimental furnace that he saw. Sir Joseph Whitworth, feeling much interest in Professor Barff's process, sent to him some steel to be oxidized, so that he might ascertain whether it did or did not lose in strength by the operation; and the result of Sir Joseph's testing was, that there had been no alteration whatever. Theoretically, one would rather expect that iron and steel would be somewhat toughened, as the tendency of the process is to anneal, and would, no doubt, if continued long enough, render some classes of cast-iron malleable. A very thin article, if excessively coated, might probably be weakened, due to the fact that the coat of magnetic oxide would form an appreciable percentage of the bulk of the article; but this, of course, is a very extreme case, and one which is not likely ever to occur in practice. The development of these processes has been a very long and tedious business, and one requiring much faith and patience in the midst of most disheartening failures for months together; but to gentlemen connected with the iron and steel industries and who know well that results are only obtained by patient and well-directed toil, I need not dwell on this, as almost every man who has had to reduce theory to practice has had abundant experience of the same kind.

THE LEAVITT SEWAGE PUMPING ENGINES.

In the afternoon, an excursion was made to the sewage pumping engines, designed by Mr. E. D. Leavitt, Jr., one of the two engines now in place being run, pumping sea-water, for the special benefit of the members of the Institute. They are compound vertical engines, having the steam-cylinders placed above the two pumps, the connecting-rods of the engines being attached to a walking-beam, which is connected with the fly-wheel. The high-pressure cylinder is 25½ inches in diameter, and has a nine-foot stroke, while the diameter of the low-pressure engine is 52 inches. The steam is carried to the high-pressure cylinder by a ten-inch supply-pipe, the engine being designed to work with an initial pressure of 100 pounds, cutting off at about 22 per cent of the stroke. In passing from the high pressure to the low-pressure engines, the steam flows by 960 five eighths inch brass tubes, through which live steam circulates. By this means, which Mr. Leavitt has also used in the famous "Superior" engine at the Calumet & Hecla mine, any moisture in the steam caused by the expansion in the high-pressure cylinder is removed and the steam is dried. It enters the low-pressure cylinder at a pressure ranging between 20 and 25 pounds, and is cut off at about one half of the stroke. The automatic governor, which is of a design patented by Mr. Leavitt, is controlled by a governor which can be run at any speed. The fly-wheel is 36 feet in diameter and weighs 36 tons. The pumps have 48-inch plungers and specially designed rubber valves with metal backing, having a high lift in order to allow the passage of large substances that are liable to get into the sewage. The bottom of the sewer is 14 feet below low water, and the maximum lift is 43 feet. It is not expected, however, that the average lift will exceed 37 feet. The nominal speed of the engines is eleven revolutions per minute, and at that speed delivers 25,000,000 gallons. At the time of the visit of the Institute, the one engine was running at 16 revolutions and was delivering at the rate of 36,000,000 gallons. The engine had not, since put up, run more than 24 hours all told, and was not at its best. They were built by the Quintard Iron-Works, of this city.

Steam is to be supplied by four steel boilers rated at 250 horse-power each, built by Kendall & Roberts. Every steel plate used was tested, the specifications being an elastic limit of 37,000 pounds, and ultimate strength not more than 65,000 pounds nor less than 60,000 pounds, and an elongation of not more than 20 per cent, nor less than 10 per cent. The boilers are 80 inches in diameter, of $\frac{7}{16}$-inch double riveted steel, the fire-box being made of $\frac{5}{16}$-inch steel. They have 132 three-inch tubes 15 feet long. The feed water is heated by the waste gases in a heater containing 1000 feet of 2-inch brass pipe, the average temperature of the feed being carried up to 180 degrees Fahr. The boilers, of which there are four, are covered with a mixture of one part plaster of Paris and two parts of sawdust held in place by straps.

THE NORWAY IRON-WORKS.

At the Norway Iron-Works, one of the most interesting subjects studied was the use of petroleum as a fuel in various furnaces in the iron-works, the device used being that developed and introduced by the Vapor Fuel Company, of Washington. We are informed that for several years the managers of the Norway Iron-Works have been experimenting in this direction, and believe that now, after numerous changes in plant and detail, they have succeeded in so simplifying and cheapening it that it is

preferable to the usual system of heating with gaseous or solid fuel. The petroleum is forced by a small pump into a cast-iron tank, which contains a receptacle to which a large surface has been given by alternate contraction and swelling of the section, by deep corrugation. Upon the surface of this interior receptacle, the petroleum drops in a small stream. Through the interior of the corrugated receptacle passes live steam, which issues from an orifice in the bottom in a superheated condition, mixing with the vaporized oil. The entire cylindrical tank is heated by a special fire-place, and the mixture of superheated steam and vaporized petroleum is directly carried by pipes to the furnaces where it is used. It is stated that no trouble is experienced by the formation of the solid, firm coke which has wrecked so many kindred devices.

Oil as a fuel has just been introduced to run a scrap-heating furnace, in which the two-ton charges are put through in twenty-five or thirty minutes. This heating furnace has regenerators at both ends, and the work it does, so far as can be gathered from its short run, is pronounced satisfactory. Near this reheating is a double puddling-furnace, also heated with oil, it having a capacity of from 12,000 to 15,000 pounds of pig, from four to five heats being got out of the furnace per ten-hour shift, or more than two single ordinary puddling-furnaces near by with a capacity of from 475 to 500 pounds of pig each. It should be stated that all of these furnaces are worked more for high quality than large production. A third furnace heated with oil is used for reheating open-hearth steel ingots. It is not provided with regenerators, the heat being utilized for making steam in a boiler overhead. For this purpose, too, the oil heating appears to give satisfaction.

The steel-mill of the Norway Iron-Works contains what is said to be one of the most successful open-hearth plants in the country, each of the three ten-ton furnaces averaging from 20 to 22 heats per week. Much attention appears to be paid to the careful preheating of the scrap used, a small heating furnace serving the line of three steel furnaces. Another feature of interest in connection with them is the casting arrangement. The steel is run into a ladle mounted on a swinging crane; and in order to do the casting as rapidly as possible and yet as quietly as practicable, the ingots, placed in a small pot, are grouped in nests of four and six. On top of each of the nests is placed a tank into which the steel is, passed, and from which it flows simultaneously into all of the ingots through four and six orifices respectively in the bottom of the tanks. The bulk of the steel made appears to be used for boiler plate. The ingots are rolled down to slabs in twelve passes in a two-high train, the slabs going to the Bay State Iron Company for further working. For various shapes, the steel is rolled in a three-high train down to 6-inch square. The mill has besides two trains for wire rods and small shapes, one train for carriage springs, one 10-inch train for shapes, a 13-inch train for spring steel of various shapes, three 18-inch trains for shapes and steel billets, and a sheet mill.

A very interesting, though small, department of the mill, is that in which the cold drawing process, patented by Mr. G. H. Billings, is carried out. Steel of various sizes and shapes is drawn cold through a die, the bars being afterward straightened. There are two machines, one with a 16-inch cylinder, and a smaller one with a 7-inch cylinder, both being capable of handling 24-foot bars and rods. We shall refer to this process and its results at greater length in a future issue. Suffice it to state now that a large variety of small and large sizes are made, which are largely used by machine builders in New England. The process has been quietly and steadily developed, and need only be more widely known to be appreciated.

After a brief visit had been paid to the Carson sewer excavating apparatus, which has for a considerable time been in practical operation in Boston, the party returned to headquarters.

THE THIRD SESSION.

The evening session was opened with a paper by Prof. W. C. Kerr, on the Geological Relations of the Topography of the South Appalachian Plateau, followed by a summary of what we learn is a very elaborate paper by Dr. T. Egleston, of the Columbia School of Mines, on the Collection of Flue-Dust at Ems. We have in our issue of July 1st, 1882, given a summary of the results at that time gathered at Ems. Since then they have been confirmed in later runs, and some additional details of interest have been developed. Prof. R. H. Richards, of the Massachusetts Institute of Technology, then exhibited some interesting experiments showing the lines of weakness in cylinders. This was followed by a valuable and elaborate paper by Mr. A. F. Hill, on the Shop Treatment of Steel. We can not do justice to it in a hurried abstract, and shall present Mr. Hill's experiments and the deductions he makes from them in a more extensive form in an early issue. The paper was discussed by Mr. R. W. Hunt, of Troy, who called attention to the use of the step punch.

On Thursday morning, the members were driven to Watertown in two parties, where the wonderful testing-machine built by Mr. A. H. Emery was fully described by Mr. Howard, who has charge of the work. We regret that, pending the issue of foreign patents, we can not, as we were prepared to do, print an illustration and a detailed description of the machine. After witnessing the testing of a steel bar made at the Norway iron-works, the party drove to Cambridge, where a few hours were spent in visiting Harvard Hall, the College Library, Hemenway Gymnasium, the Physical Laboratory of the Lawrence Scientific School, the Museum of Comparative Zoölogy, Memorial Hall, Boylston Hall, the Chemical Laboratory, and the Mineral Collection, a lunch was partaken of in Memorial Hall.

THE FOURTH SESSION.

A brief session was held in Boylston Hall, Prof. S. P. Sharples reading a paper on the Strength of American Woods, in which he presented the result of a large series of tests and experiments made under the auspices of the Census Bureau, and partly published by it in bulletins Nos. 18 and 22.

Before the close of the session, Professor Cook, of Harvard University, showed in a beautiful manner the "critical point" observed in heated liquid carbonic acid at a blood temperature. The carbonic acid was seen to expand rapidly as heat was applied, the surface of the liquid gradually becoming indistinct and nebulous and finally being impossible to trace.

In the evening, nearly two hundred ladies and gentlemen sat down to the subscription-dinner at the Brunswick Hotel.

THE QUALIFICATIONS OF BLAST-FURNACE COKE.

Mr. John Fulton, mining engineer of the Cambria Iron Company, a gentleman who has closely studied the question of the qualifications of coke as a blast-furnace fuel, has recently written as follows to the Connellsville *Keystone Courier*:

My attention has been called to a friendly controversy now pending between the editors of the *Keystone Courier*, of Connellsville, Pennsylvania, and *The Virginias*, of Staunton, Virginia, on the important industrial question of the relative merits of Connellsville and West Virginia coke, for blast-furnace use, in the manufacture of Bessemer pig-iron.

I understand the grounds taken by the parties in this discussion rest upon the evidence of chemical analyses, especial emphasis having been laid on the relative volumes of *phosphorus*, the *Courier* asserting that the Virginia coke holds a larger percentage of this dangerous element than the Connellsville.

On the other side, *The Virginias* denies this, and submits analyses by Prof. A. S. McCreath, Chemist of the Second Geological Survey of Pennsylvania, showing less phosphorus in the West Virginia coke. Neither party questions the accuracy of the chemical analysis of these cokes, but there are objections to the manner of quoting the results. *The Virginias* submits Professor McCreath's analyses in Report MM, page 127, as showing 0·0344 per centum of phosphorus in Connellsville coke—the same authority finding only 0·008 per cent of phosphorus in the New River, West Virginia coke.

It will be noted that Professor McCreath does not say that the twenty-four coals examined by him from the Pittsburg coal-bed were all from the Connellsville region. This large Pittsburg bed covers an extensive corner of the State on its southwest side. The inquiry now is confined to the Connellsville coal and coke region—not designed to embrace all Southwestern Pennsylvania. Now in Report MM, in coke from the large establishments of Messrs. Dravo, Frick & Company, which afford prominent types of Connellsville coke, the phosphorus is given at 0·014 per cent.

A recent and exhaustive test for phosphorus has been made from a large sampling of the coke made at the extensive works of the Cambria Iron Company, near Connellsville, selected by John McFadyen, superintendent of coke department, by Prof. T. T. Morrell, chemist, showing only 0·01 per cent of phosphorus. J. Blodget Britton, chemist, Iron Masters' Laboratory, Philadelphia, in his analysis of the coke quoted by *The Virginias*, shows 0·027 per cent of phosphorus.

We have, therefore, two determinations by different chemists of Connellsville and West Virginia cokes, as follows:

	Connellsville.	West Virginia.
A. S. McCreath	0·014	0·008
T. T. Morrell	0·010	.....
J. Blodget Britton	.....	0·027

Showing an average of phosphorus in Connellsville coke of 0·012, and in West Virginia 0·0175. Both these cokes are low in phosphorus, and the slight difference in favor of Connellsville should not alone afford evidence of its superiority.

The following analyses of these cokes will show their relative composition:

	Connellsville.	West Virginia.
Moisture	0·030	0·110
Volatile matter	0·460	0·350
Fixed carbon	89·576	92·181
Sulphur	0·821	0·618
Phosphorus	0·014	0·027
Ash	9·113	6·680

From the above, it will be readily seen that there are no large differences except in the ash, which is somewhat greater in Connellsville. This difference would not afford grounds for a claim in favor of West Virginia coke; for it will be shown that, while purity is one of the prime factors in superior coke, yet there are other vital considerations that decide the value of this fuel for metallurgical purposes. The inquiry is here pertinent: What constitutes superiority in coke for blast-furnace use in producing Bessemer pig-iron?

In the preparation of coke for blast-furnace use, four conditions are regarded as essentials:

1. Hardness of body. 2. Well-developed cell structure. 3. Purity. 4. Uniform quality of coke.

I. HARDNESS OF BODY.—The best coke must possess hardness of body or cell-walls—not density, for dense cokes are frequently soft or punky, while hard cokes generally afford a well-developed cell structure. These two physical properties, hardness and full cellular spaces, are correlated, just as softness and density are associated.

The prime requirement of hardness of the body of coke will be evident, when the conditions of its combustion in a blast-furnace are considered. In its movement down the furnace, from the charging-plates to a short distance above the tuyeres, it is enveloped in a current of hot carbonic acid gas. This gas possesses the power of dissolving carbon or coke, and is especially destructive to the soft variety. Every pound of coke dissolved by this gas in the upper section of the furnace is a double loss, by the reduction of temperature where the action takes place, and in the loss of a pound of fuel, which should have been burnt near the tuyeres. I. Lowthian Bell has shown by direct experiment that all forms of carbon are not equally easily affected by carbonic acid; that hard coke is capable of resisting its solvent action much more than soft coke; the latter suffering by dissolution, during a test of thirty minutes, six times the loss of the former. (Bell's *Iron Smelting*, pages 413, 414.)

The value of a coke in a condition of hardness in which it is least susceptible of being oxidized in the region of the furnace where its combustion proves a double loss needs no further emphasis.

II. WELL-DEVELOPED CELL STRUCTURE.—Next to hardness of body in coke, a well-developed cell structure is second only in importance. This arises from the fact that, other things being equal, the calorific energy of a fuel is in proportion to the surface exposed to the oxygen of the blast in the region of the tuyeres. Hardness with density of physical structure as found in anthracite, which is a natural coke produced under great pressure, illustrates this position conclusively by the actual work. The following records illustrate this difference in density, with corresponding results in blast-furnaces running on Connellsville coke and anthracite coal:

Connellsville Coke.

The run of the Carnegie Brothers & Co.'s Edgar Thomson E furnace,

at Pittsburg, for the three weeks ending November 11th, was 1465 tons, 1629 tons, and 1540 tons respectively. This output was on 54 per cent ore, and was made on one pound of coke to one pound of iron. Their D furnace has made 299 tons in one day, 1840 tons in seven, and 7332 tons in 31 consecutive days. The ton used is 2268 pounds.

Anthracite Coal.

The yield of pig-iron at Colebrook furnaces during the week closing Saturday, December 16th, was 577 tons at No. 1 furnace and 575 tons at No. 2 furnace. The total yield for the week from both stacks was 1152 tons. No. 1 furnace has been in blast fourteen weeks, and has produced in that time 6446 tons of pig-iron, averaging 460 tons per week. No. 2 furnace has been in blast five weeks, and produced in that time 2389 tons, averaging 478 tons of pig-iron per week. Cornwall ore was used exclusively; the fuel used was anthracite. These are the two new furnaces of Robert H. Coleman, at Lebanon, Pa. No. 1 is 55 feet high by 14½ feet in diameter; No. 2 is 80 feet high and of the same diameter as its mate. The ton used contains 2250 pounds. (*Iron and Steel Bulletin.*)

Without insisting on the very large product of these coke-furnaces, it is submitted that, other conditions being equal, the average energy of these fuels would be represented as follows:

Coke, furnace, 800 tons of pig-iron per week.
Anthracite, furnace, 500 tons pig-iron per week.

This exhibits a relation of Connellsville coke to anthracite coal of 8 to 5. A careful test of two cokes differing in density, made at Conemaugh furnace, showed a loss of 11 per cent in product arising from the denser coke alone.

The following table will illustrate the physical properties of Connellsville, West Virginia, and other cokes for general comparison:

Physical Properties of Cokes.

LOCALITY.	GRAMS IN ONE CUBIC INCH.		POUNDS IN ONE CUBIC FOOT.		PERCENTAGE.		Compressive strength per cubic inch (¼) ultimate strength.	Hight of furnace charge, supported without crushing.	Order in cellular space.	Hardness.	Specific gravity.
	Dry.	Wet.	Dry.	Wet.	Coke.	Cells.					
Connellsville	12·46	20·25	47·47	77·15	61·53	38·47	284	114	1½	3·50	1·500
West Virginia	13·76	21·19	52·44	81·56	64·32	35·67	258	103	1	3·15	.....
Broad Top	11·76	20·18	44·81	76·88	58·27	41·73	240	96	1	3·35	1·342
Clearfield	14·79	19·86	56·35	76·69	74·43	25·57	319	128	1	3·60	1·560
Cumberland	12·76	21·63	48·61	82·41	58·99	41·01	215	86	1½	3·00	1·750
Alabama	13·30	18·29	50·70	69·01	73·17	26·23	225	87	1	3·50	1·493
Illinois	11·06	17·09	42·02	65·09	63·79	36·21	180	70	1	3·20	1·215

Chemical Analyses of Cokes.

LOCALITY.	Fixed carbon.	Moisture.	Ash.	Sulphur.	Phosphorus.	Volatile matter.	REMARKS.
Connellsville	89·57	0·30	9·11	·820	·014	·460	Chem. analysis, Prof. A. S. McCreath.
West Virginia	92·18	0·11	6·68	·618	·027	·350	Chem. analysis, J. B. Britton.
Broad Top	89·28	.....	8·66	1·060	.....	.....	" " T. T. Morrell.
Clearfield	89·86	0·54	9·41	.....	.....	·667	" " Booth, Garret & Blair.
Illinois	89·77	0·12	9·58	0·930	·033	.....	Good coke, T. T. Morrell.

From a careful inspection of this table, which affords a wide range of typical cokes, it will be seen that, while some approximate very closely to Connellsville in certain physical and chemical properties, yet no one inherits so many essential requisites in equal degree with it.

III. PURITY.—It has not come under the writer's observation that any comprehensive law has been eliminated, from reliable determinations, locating the greatest volumes of sulphur or phosphorus in any special zone of the Appalachian coal-field. Sulphur, free or combined with iron, is mainly found in the coal slates. In some instances, these slates are interleaved in very thin plates with the coal, so as to render washing unsatisfactory. In other coals, the pyrites are found in lenticular pieces, which are readily removed by crushing and washing. Hence it follows, in a general way, but not always, the more slate the more sulphur. Mr. McCreath has shown that twenty-five coals examined, containing an average of 2·138 per cent sulphur, yielded cokes containing an average of 1·912 per cent of sulphur.

Phosphorus is a more difficult element to locate. The inquiry as to its relative volumes in the coal and its slates will probably be answered when Prof. J. P. Leslie arranges the valuable data now collecting in the Second Geological Survey of Pennsylvania. Mr. Britton found in two samples of anthracite coal for furnace use, ash, 10·43; phosphorus, 0·049: and ash, 5·29; phosphorus, ·0354. In examining two semi-bituminous coals, he found in one, ash 5·03; phosphorus, ·0085: and in the other, ash 4·94, and phosphorus only a trace. (American Institute of Mining Engineers, Vol. I., page 298.) In a recent series of tests for phosphorus in brown hematite iron ore, an average of ·099 was found in clean ore, ·068 in the clay in the ore, and ·012 in the rock matter associated with the ore.

One general principle may be safely deduced from the foregoing data: That, other things being equal, the less ash in the coke, the less risk of sulphur or phosphorus in dangerous volumes in the resultant pig-iron from the furnace. In many cases, there is danger of injuring the physical condition of coke by the operation of washing the coal to reduce its slate. The washing of some coals improves the coke; in others, it injures it.

In the discussion of this matter at the Hazleton meeting of the Institute of American Mining Engineers, in 1874, "Mr. Bell further remarked, as to the relative value of coke made from washed and unwashed coal, he was of the opinion that coke made from coal that did not require washing was superior to that made from washed coal." (Vol. III., p. 182.) Washing coal carries out in the operation valuable hydrogenous matter which aids in developing cell structure. The coke made from it would be more dense; in other words, in many cases, the loss in calorific energy by the density in the coke for washed coal would more than overtop the advantage of a reduction of ash, except in cases where ash is excessive.

IV. UNIFORMITY OF QUALITY IN COKE.—This is one of the essential requirements, in view of the destructive action of carbonic acid gas on soft coke. The "black-ends," which are sometimes made in coking, are worse than useless in a blast-furnace, and, if reckoned in the fuel charge, must produce bad results. Hence, a carefully prepared coke, alike all through, is most desirable for regular work in blast-furnaces. This result can be best obtained from coal similar to the Connellsville, inheriting a liberal ratio of hydrogenous matter to assure full oven heat and thorough coking in every part of the charge. This is one of the distinguishing features of Connellsville coke.

The Connellsville coal region is a separate prong of the Upper Coal Measures resting along and near the western foot of Chestnut Ridge. It is two or three miles broad and sixty miles long. The coal-bed is from eight to ten feet thick, affording a bright, soft coal in thin-sliced vertical plates. The "Pittsburg bed," as it is pursued east to Salisbury and Cumberland, affords a coal lower in hydrogenous matter and yields a coke inferior to Connellsville. Westward, the excess of pitchy matter in the coal leads to an inflated physical structure in coke.

It is thus evident that the Connellsville coal embraces in a larger degree than any other at present developed the properties that make excellent coke. Its coal requires no washing and no special arrangements for coking. Its coke has grown in the confidence of furnace managers until it has now attained the distinguished position in America which the celebrated Durham coke enjoys in England.

ACCIDENTS IN ANTHRACITE COLLERIES.

A correspondent of the New York *Sun* has been gathering the statistics of accidents in anthracite collieries, and his report is of interest as showing what conclusions an intelligent outsider reaches. We are far from indorsing all he says; but his opinions are worthy of being put on record:

It is somewhat startling to think that during the last year no less than 300 persons were killed and more than 1000 injured in various ways at the peaceful calling of mining anthracite coal in Pennsylvania. Yet this is the thrilling record. There are six anthracite mine inspectors in Pennsylvania, provided for by law and paid from the State treasury, to see that the provisions of the Mine Ventilation act, which was brought forth by the Avondale horror, are enforced. These inspectors are stationed in various parts of the State, and to their courtesy I am indebted for the figures which I have quoted. Only one of the reports given below is unofficial, namely, that of Inspector Ryan of the Shamokin District. The following is the frightful record of the anthracite region for 1882:

	Killed.	Injured.
Inspector Williams, of Wilkes-Barre, reports	73	185
Inspector Broderick, of Hazleton, reports	40	130
Inspector Gay, of Pottsville, reports	20	94
Inspector Mauchline, of Shenandoah District, reports	40	167
Inspector Blewitt, of Scranton District, reports	77	288
Inspector Ryan, of Shamokin (estimated)	50	150
Totals	300	1,014

Of the accidents reported by Inspector Williams, of Wilkes-Barre, 10 persons were killed and 49 injured by explosions of gas, 22 were killed and 49 injured by falls of roof and coal, 4 were killed by falling down the shaft, 16 were killed and 39 injured by mine cars, 8 were killed and 12 injured by explosions of powder, 8 were killed and 18 injured by "miscellaneous causes," and 5 were killed and 17 injured by accidents of various kinds outside the mines. Of the 94 persons injured in the Pottsville District, 11 had legs or arms broken, and a large proportion of the others met with serious wounds. In the Shenandoah District, Mr. Robert Mauchline reports that 15 persons were killed by fall of roof, 7 by the cars, 7 by explosions of gas, 2 by powder, 3 on the slopes, and the others in various ways. In the Scranton District, of which Mine Inspector Blewitt has charge, most of the serious casualties of the year are due to falls of roofs in the mines, which is often the result of inadequate propping. Many of the men who were killed leave large and helpless families, and the condition of those little homes in which men are sadly maimed is almost as pitiful.

As an illustration of the class of accidents coming under the heading of "serious injuries," I will cite a case of a miner with whom I am personally familiar. Six months ago, there was a fall of roof in the chamber of the mine in which he worked. He was badly crushed under a great mass of rock and coal; but when he was extricated, it seemed as though he would recover soon. But he was injured internally, and, after a most tedious and costly experience, he is now able to walk about, the mere shadow of his former self. His nervous system is shattered. He will not remain in a room alone because of the sensation of the great fear that the roof will fall upon him, and he rarely walks any distance from his door unless somebody accompanies him. This man has a wife and several little ones, and the prospects of his ever being able to work for them again are not bright. There are many cases of this kind among those injured, and some are even worse. Of the 288 reported injured by Mr. Blewitt of this district. 88 are seriously hurt and permanently disabled.

Of course, it is impossible to avert some of the disasters which result in death in the mines; but it is possible, by observing proper caution and complying rigidly with the provisions of the Mine Ventilation law, to lessen the misery which sends a surge of sorrow annually along the coal valleys of Pennsylvania. Falls of roof might be greatly lessened by using sufficient timber in propping, explosions of gas could be averted by a careful use of the safety-lamp, and the deaths occurring from explosions of powder are almost inexcusable. A more uniform system of working the mines on the part of the companies would also reduce the death record of the region. It is either a headlong rush to supply the demand or a suspension to create one. When the mines are worked, every thing is strained to the very highest tension, and the wonder is, that there are not more accidents. Working more regularly, taking time to keep the mines

in proper condition as their development progresses, and paying some heed to the lives of the industrious and courageous population that gives life and energy to the most important industry in the State, would accomplish the same results in the market, and leave fewer broken hearts in the track of the anthracite trade.

There is every evidence that the present Legislature of Pennsylvania intends to do something in the way of reforming, by the enactment of needed laws, many evils that now exist in the anthracite regions of the State. In the House, Mr. Hines, of Luzerne County, representing a mining constituency, has already signaled his intentions; while in the Senate, Mr. King, of Schuylkill, will soon introduce a bill creating a commission to make inquiry into the ventilation law, and report by bill or otherwise what amendments are necessary to carry out its purpose—the protection of the lives and limbs of those who work in the dark chambers of the collieries. It is proposed to make up this commission of the six mine inspectors, six practical coal miners, and six operators to be selected by the governor.

The present ventilation law was the outcome of the terrible calamity at Avondale in 1869, where scores of miners lost their lives. Up to that time, none of the collieries was provided with any means of escape from a fire at the top. The men went down the main shaft and came out of the mine the same way. There were no safety openings. At Avondale, the giant breaker which stood directly over the deep shaft took fire, and, as a natural sequence, drew every breath of air out of the chambers below, where more than one hundred men were at work. They were all suffocated. That calamity occurred nearly fourteen years ago. The frightful lesson had its effect upon the succeeding legislature, and what is known as the ventilation law was passed. That compelled the coal companies to construct openings through which the miners might escape if shut off from passing up the main shaft by any disaster. Since these openings were made, however, there is not a colliery anywhere that has not extended its workings far beyond what were the boundaries a dozen years ago, in some instances running over a mile ahead of them. If it is supposed that the companies have made new openings from time to time as they were needed, the idea is a great mistake. They have done no such thing. The ancient opening stands, although in the great majority of instances of no practical value whatever, and there can be no prosecution of any violation of the law.

There are dozens of big mines in this locality where the breakers are built just as the Avondale breaker was, directly over the main shaft. If any one of them should happen to take fire while the men are down below, the results would be horrible enough. The old safety opening, instead of being a help in time of danger, would only add to the difficulties by creating a draught through which the smoke would be drawn into the chambers in suffocating volumes. But, aside from this, the mines with the passage of time become more gaseous. To illustrate: Twelve years ago, when the present ventilation law was passed, there were only 8000 persons employed in the collieries of this, the middle district of the Wyoming region, and only two or three mines at that time generated explosive gases. Now there are 16,000 men employed in the same district, and over three fourths of the collieries are generating explosive gases in large quantities. Years ago, the miners could work with the provision of 10,000 or 12,000 cubic feet of fresh air per minute. Now, in most of the collieries, it requires over 250,000 cubic feet per minute to dilute the gases and make working safe. The reason why more air is needed now than formerly is because the workings have gone down to the solid and deeper bases. Unquestionably, there is need of fresh legislation in the important matter of mine ventilation.

Mr. Williams, the Inspector for this middle district of the Wyoming region, has figured out the losses, and they are appalling enough. No less than 73 men were killed in the mines of the district last year, and 185 injured, half of the latter seriously, incapacitating most of them for doing any work in the future. There were 35 widows and 91 orphans made by these accidents in the middle district last year. It is unquestionably true that a large number of mishaps might be avoided if the companies cared to correct certain evils that exist. But they do not do that, and, therefore, to the carelessness of the men must be added the culpability of the corporation when we come to estimate the causes that produced the sorry results of the year.

For some time past, the Hungarians, who have been flocking in dirty battalions to the coal-fields for over a year, have been the greatest sufferers by mine disasters. As a general thing, they have been employed as laborers in the collieries, their duty being simply to fill the cars after the miner has finished knocking down his coal for the day. Each miner employs a laborer, whose work he pays for himself. Labor has been so scarce in the coal-fields for a year past that the Hungarian has found no difficulty in obtaining work as soon as he got among the mines. But his ignorance and lack of knowledge of the English language have been sources of great annoyance to the mine bosses, who are charged with instructing mine workers in the dangers that threaten at all times. By signs alone are the Hungarians made partly to understand the dangers of their employment, and even these are frequently of no avail. They daily persist in going into all sorts of danger, and fully three fourths of the gas explosions occurring last year in the mines of this district are traceable to the ignorance of the Hungarian laborers.

THE CARVÉ COKING SYSTEM.

Dr. Angus Smith, her majesty's inspector under the alkali acts, says in one of his yearly reports that "the present method of making coke in England has all the appearance of roughness and savagery which extravagance always produces." A final change in this direction seems now generally to be creeping in after the several abortive attempts of former years. The paper read in London by Mr. H. Simon, of Manchester, in 1880, before the Iron and Steel Institute, was mainly instrumental in bringing the question again before those most interested in it. According to English journals, Messrs. Pease and Partners, of Darlington, were the pioneers in taking up the system recommended, and patented by Mr. Simon in England. The success of the process had previously been fully demonstrated in France. The Messrs. Pease proceeded to build a battery of twenty-five ovens, which have now been at work for a considerable time. The firm appears to have done full justice to the invention, and has spared neither trouble nor expense to make it a success. All the figures and statements given by Mr. Simon in his paper as to the results obtained in France seem to have been completely confirmed, and in some respects surpassed. Above all, it has now been practically proved that the coke obtained in these ovens is excellent, and leaves nothing to be desired as furnace coke. It is of great hardness, and is said to contain less sulphur. The latter circumstance is easily understood, if it is considered that the gas evolved during the process is in this system continually sucked or pumped away, including, of course, a good percentage of sulphur in gaseous form. The quantity of coke is increased to fully 75 per cent (after deducting moisture) of the coal charged. This, in itself, and comparing it with the ordinarily obtained percentage of from 62 to 65 per cent of coke, is a gain of 10 per cent in coke, or equal to, say, 1s. per ton of coke made. The by-products, in the shape of tar and ammonia-water, amount in value to between 5s. and 6s. per ton of coke made, assuming tar to be worth 3d. per gallon, and ammonia-water 1d. per gallon.

Each of the coking-chambers built at Crook, at the Pease's West Collieries, produces about one ton in the twenty-four hours. The total possible extra profit realized over and above the previous ordinary profit in coke-making would, therefore, appear to be about 1s. for extra quantity of coke, and from 5s. to 6s. for by-products, or from 6s. to 7s. per ton of coke. Against this should be set a possible slightly increased expense in the working of the ovens. It seems that the expenditure under this head amounts to about 1s. 6d. per ton, as against nine to twelve pence under the old system. It is stated on the authority of one of the best known chemical manufacturers in the North of England, who has analyzed and used the tar made according to the Simon-Carvé system at Messrs. Pease's works, that its quality is even superior to the best average tar obtained from gas-works. It is possible that the value of the by-products would by an over-production be reduced to some extent; but it is said that, as far as tar is concerned, the value of this product has been increasing considerably of late, on account of its increasing importance for the manufacture of aniline dyes. With regard to the ammonia-water, it is believed that, if the price were to fall a little, an almost unlimited inquiry for its use as artificial manure in agriculture would be sure to spring up, the only reason why it is less used at present being that the cost is still somewhat too high.

Within certain limits, it may be considered to be a drawback to this system that the establishment of the coke-ovens and apparatus seems to be rather expensive. In view, however, of the extraordinary returns which would make it appear that the whole cost of the establishment would be refunded by the returns of less than two years' working, this question can not be considered of very great importance, at least not for any of the many wealthy firms in that particular trade.

CANADIAN APATITE.

Written for the Engineering and Mining Journal.

The numerous openings made by prospectors and miners in the phosphate regions of the provinces of Ontario and Quebec have afforded excellent opportunities for the study of the Laurentian minerals and their mode of occurrence. The crystalline limestones of the Laurentian series are remarkable for their great extent and for the variety of crystalline minerals which they contain. They are interstratified with beds of dolomite, which sometimes contain a portion of carbonate of iron, and inclose serpentine, tremolite, quartzite, and a little white mica, but are generally less abounding in foreign minerals than the pure limestones. Several mineral species might be mentioned as marking bands in the stratification. Among these, there are apatite, chondrodite, pyroxene, magnesian mica, and graphite. Apatite or phosphate of lime is one of the principal features of the limestones of the Laurentian series. It is found in a variety of colors and shapes, sometimes in rare crystals disseminated throughout the veins; at others, in solid masses, in veins of great width. Sometimes, it is in the form of prisms. These are generally rough, but often terminated, and always have their angles rounded. Apatite is generally associated with pyroxene, which has also been found in large crystals. It is sometimes found with phlogopite. In a crystal of the latter, about four inches in diameter, a crystal of apatite about a quarter of an inch thick and two inches long was found imbedded, the axis of the prism being parallel with the cleavage of the mica. Rounded masses of calcite are often inclosed in the apatite, which in its turn is frequently in rounded pale-green crystalline masses imbedded in the coarse-grained limestone.

Apatite is used in the arts for the manufacture of phosphoric acid and phosphorus, and enters largely into the composition of certain porcelains. It is, besides, very extensively used as fertilizer of the soil. Phosphates are among the minerals most essential to vegetation, and are removed from the earth in large quantities by growing crops. The importance of a supply of phosphates to the soil is made very evident by the fact that the mineral constituent of the bones of animals is for the greater part phosphate of lime. This material, whether in the form of bones, coprolites, or apatite, is seldom applied to the soil in its insoluble state, as it is then comparatively unavailable for the nutrition of plants. To render it fit for agricultural purposes, it is converted into a soluble salt, which is known as a superphosphate of lime. The process of conversion is as follows: In the insoluble mineral or bone phosphate, one equivalent, or 71 parts, of phosphoric acid, is united to 3 equivalents of 28 parts each of lime, making the equivalent weight of the ordinary phosphate of lime 155. In order to reduce this to the soluble superphosphate, which contains one equivalent of phosphoric acid and one of lime, it is necessary to remove two thirds of the lime, or two equivalents. This is effected by adding two equivalents, or 98 parts of sulphuric acid, which form with this lime 136 parts of sulphate. One hundred parts of ordinary phosphate of lime, therefore, require 63·2 parts of sulphuric acid to convert them into the soluble superphosphate with one equivalent of base. In this process, however, regard must be had to the foreign matters which accompany the phosphate, and which may also require sulphuric acid for their decomposition. Of these, the principal are fluoride of calcium and carbonate of lime. The former is always present in small quantities in bones and in still larger amounts in many of the mineral phosphates, and requires for decomposition of 100 parts, 125 of sulphuric acid

while carbonate of lime, as an impurity, requires 98 parts of acid to decompose 100 parts.

Of late years, the increasing demand for phosphates as fertilizers has drawn attention to the use of the crystalline mineral phosphate of lime, or apatite, of which large quantities have been imported from Norway into England, and attention has recently been turned to the abundant supplies of this substance found in Canada, and large importations have recently been made from the Canadian phosphate regions into England. The present price for apatite in England is one shilling and five pence per unit, or about $30 per ton, for a first-class grade. Capital is slowly investing in the phosphate lands of Canada. Railroad enterprise is moving for the purpose of transportation, and the time is drawing near when the mining or quarrying of phosphates will be one of the largest and best-paying industries in Canada. The cost of production being small, but very little capital is necessary, and the large and continued demand fixes the price for which the mineral can be sold at such a figure that, as a profitable undertaking, not a doubt remains.

THE MANGANESE DEPOSITS OF SOUTHERN RUSSIA.

A few years ago, two Russian engineers, Batsevitch and Simonovitch, in preparing a geological map of the Caucasus, in Southern Russia, were struck with the occurrence of a large and continuous deposit of pyrolusite cropping out on the banks of the Kvirila, a tributary of the Reon River, which empties into the Black Sea at Poti, near Batoum. These deposits are extremely interesting geologically; but however great an excitement they created at one time, they appear to be of comparatively little consequence so far as the markets of manganese are concerned. It is estimated by a writer in the *Génie Civil* that the consumption of manganese ore in the world is not more than 100,000 tons, of which only a quarter is used in the chemical industries, the rest being used in blast-furnaces for the manufacture of ferro-manganese and spiegeleisen. The principal reasons why the Russian deposits, though extensive, are not likely to affect the markets much are, that they can not compete with the newly-found deposits in Central Spain, the freights to the sea-board being excessive, and the irregularity of their contents of phosphorus, which ranges from two thousandths of one per cent in the solid varieties to one per cent in the earthy ores. With care in picking, the latter trouble may be overcome.

The pyrolusite is found as a horizontal bed in Miocene fine-grained sandstones resting upon Cretaceous limestones. Parts of the bed have been removed by erosion, so that it crops out on both banks of the Kvirila River and its tributaries, the deposit being traced near Perevisse, Choukroutis, and Itkvissa on the left, and near Tchiatoura, Rgani, and Tsirkvali on the right bank. The Kvirila Valley has been opened by a railroad connecting Tiflis with Poti on the Black Sea, which is, however, a poor port. The bed of manganese ore, the first pyrolusite thus found, has a total thickness ranging from 6 to 9 feet, and consists of alternate layers of compact and oolithic pyrolusite of shales and sandstone, the thickness of the individual layers varying. The aggregate thickness of compact shipping ore, low in phosphorus, is from 24 to 28 inches.

SOME SWEDISH EXPERIMENTS WITH THE BESSEMER PROCESS.

Mr. C. G. Dahlems has reported to the Swedish Iron Board the results of a series of analyses of samples of metal and cinder taken at different stages of the Bessemer process, at the Langshyttan, Nykroppa, Bangbro, and Westanfors steel-works. Ferro-manganese was added at the close at the first three works, the quantity of pig charged and ferro-manganese added being as follows: Langshyttan, 60 cwts. of pig and 0·4 of ferro-manganese; Nykroppa, 71 and 0·3 cwts.; Bangbro, 53 and 0·5 cwts. respectively; and Westanfors, 63 cwts. of pig and no ferro-manganese. The following are the analyses, tabulated:

	Langshyttan.	Nykroppa.	Bangbro.	Westanfors.
Pig-iron:				
Carbon	3·94	4·35	4 00	4·22
Silicon	1·14	0·88	1·02	1·06
Manganese	0·64	1·15	1 83	5·12
Metal:				
First sample. Time	2 m. 15 s.	2 m. 30 s.	3 m.	4 m. 15 s.
Carbon	4·02	4 01	4·03	4·02
Silicon	0·04	1.10	0·03	0·43
Manganese	0 12	0·15	0·22	3 26
Second sample. Time.	4 m. 30 s.	5 m. 30 s.	4 m. 45 s.	8 m. 35 s.
Carbon	1·10	1·00	0·90	1·30
Silicon	0·03	0·05	0·03	0·12
Manganese	0·12	0·15	0·12	0·85
Third sample. Time.	5 m. 30 s.	6 m. 30 s.	5 m. 45 s.	9 m. 20 s.
Carbon	0·05	0·08	0·10	0·55
Silicon	0·01	0·04	0·03	0·07
Manganese	0·06	0·08	0·09	0·43
Cinder:				
First sample. Same time.				
Oxide of iron	34·72	13·50	14·20	4·20
Oxide of manganese	13·95	29·76	26·31	46·38
Magnesia	0·24	0·23	0·22	0·54
Lime	2·60	0·42	0·62	1·26
Alumina	0 78	2·28	2·86	3·08
Silica	48·76	53·26	55·26	45·87
Second sample.				
Oxide of iron	21·08	9·34	18·52	6·24
Oxide of manganese	13·48	23·70	31·01	52·26
Magnesia	0·30	0·28	0·14	0 29
Lime	3·25	0·60	0·38	0·70
Alumina	0 98	3·90	2·70	2·49
Silica	59·82	62·34	47·20	39·07
Third sample.				
Oxide of iron	35·82	30·60	31·19	9·45
Oxide of manganese	12·29	21·39	25·43	48·92
Magnesia	0·21	0·21	0·11	0·46
Lime	2·35	0·38	0·32	1·90
Alumina	0·72	2·14	2·24	2·94
Silica	48·48	44·54	40·50	37·63

On examining this table, it will be found that the result of the Bessemer process is chiefly dependent on the quantity of manganese in the pig; if the contents of manganese are small, as, for instance, at Langshyttan, the oxidation of nearly all the silicon and manganese takes place at the beginning of the blowing, before any carbon is as yet eliminated, while the silica and oxide of manganese, as well as a small quantity of oxide of iron formed, constitute the slag. The elimination of the carbon begins first at this point, which, however, as the process proceeds, becomes so rapid that the tuyeres can not supply the oxygen which the carbon requires, and some is also taken from the oxide of iron in the cinder; but as iron is also eliminated from the cinder, the latter decreases in quantity, by which the percentage of the other constituents increases. This is just the case with the cinder taken after decarbonization at Langshyttan and Nykroppa, where pig-iron containing less manganese was employed. It is, however, possible that the percentage of silica and alumina have been somewhat increased in these cinders by fire-clay loosened from the walls of the furnace. This seems, at all events, to have been the case at Nykroppa, where not only the percentage of oxide of iron, but also of oxide of manganese has been reduced, while the other constituents have been increased.

THE PRODUCTION OF RAILS IN 1882.

Reports have now been received by the American Iron and Steel Association from the owners of all the mills in the United States that rolled iron and steel railroad bars in 1882. These reports show that the total production of iron and steel rails in this country last year was 1,688.794 net tons, or 1,507,851 gross tons. As the production in 1881 was 1,844,100 net tons, or 1,646,518 gross tons, there was a falling off in 1882, as compared with 1881, of 155,306 net tons, or 138,667 gross tons, which is equivalent to a decrease of 8 per cent. There was a decrease in every State but six—Vermont, Massachusetts, Missouri, Colorado, Wyoming, and California.

No rails were made in 1882 in New Jersey, Virginia, and Georgia, in all of which States rails had been made in 1881. The number of rail-making States, therefore, fell to 18 in 1882, against 21 in 1881. The following table shows the production of the various kinds of rails in 1882, as compared with 1881, in net tons:

Kinds of steel.	1881.	1882.
Bessemer steel	1,330,302	1,438,155
Iron	488,581	227,874
Open-hearth steel	25,217	22,765
Total	1,844,100	1,688,794

This table shows that the quantity of Bessemer steel rails made in 1882 exceeded the quantity made in 1881, while the production of iron rails fell off heavily and that of the open-hearth steel rails fell off slightly.

The five leading rail-making States are Pennsylvania, Illinois, Ohio, New York, and Missouri. Their production of iron and steel rails in 1882, as compared with 1881, was as follows, in net tons:

States.	1881.	1882.
Pennsylvania	891,179	850.908
Illinois	433,420	362,250
Ohio	153,596	113,806
New York	109,283	105,021
Missouri	64,226	85,528
Total	1,651,704	1,517,513

PROGRESS IN SCIENCE AND THE ARTS.

The Manufacture of Magnesia.—The manufacture of magnesia for a variety of purposes is beginning to assume proportions abroad that render it a subject of interest. Sorel, as early as 1867, called attention to the fact that pure caustic magnesia, mixed with a solution of chloride of magnesium, becomes a solid mass, which has the hydraulic qualities of cement. He established works in Paris, which still make a very white cement, capable of being colored and used for a variety of purposes. Sorel uses magnesite from the island of Eubœa as a raw material, because it is exceptionally pure and free from quartz. A year later, Caron published experiments proving how refractory magnesia is. He found that magnesite calcined at the highest temperature was not sufficiently plastic alone, and he therefore mixed it with from 5 to 10 per cent of slightly calcined magnesia, and this mixture is recommended in manufacturing refractory materials from magnesia obtained by any process, because the bricks and crucibles made shrunk but little. His results did not attract much attention until the importance of the basic dephosphorizing process was admitted, and then German chemists suggested the final liquors obtained in the manufacture of potash salts at Stassfurt and Leopoldshall as a raw material. The bulk of these liquors was wasted, although they contain from 27 to 30 per cent of chloride of magnesium. It is estimated that when 70,000 cwts. of carnallite are daily treated, the final liquors hold from 16,000 to 18,000 cwts. of anhydrous chloride of magnesium, from which 5000 cwts. of magnesia could be manufactured daily. Herr Ramdohr some time since, at a meeting of the Society of Engineers, described the method of manufacture adopted. The plan of precipitating the magnesia with burnt lime has never been practically adopted, because the magnesia precipitated is very voluminous, and can not readily be rid of the chloride of calcium adhering to it; nor has the Closson system of substituting dolomite for lime been introduced. The system actually in use by Messrs. Ramdohr, Blumenthal & Co. for about a year, after almost two years of experimental work, is to decompose the chloride of magnesium by heating it. It has been known for a long time that chloride of magnesium is partially decomposed by being subjected to an elevated temperature, magnesia and hydrochloric acid being formed. But from 9 to 10 per cent of chlorine remain in the solid residue when heating is simply resorted to. By using an oxidizing flame and highly superheated steam, no trouble has been found in obtaining nearly chemically pure magnesia and hydrochloric acid of 21 degrees Beaumé, and besides gathering the bromine in the solution. The magnesia thus made is fine white powder, which absorbs carbonic acid and moisture from the air if dried at from 180° to 200° Celsius; but it loses this property to a great extent when calcined at a white heat. Magnesia dried at a low temperature is pronounced a superior material for cement, five parts of it being mixed with four parts by weight of a solution of chloride of magnesium of from 25 to 30 Beaumé. It is stated that this cement will bear a very large admixture of sand—as high as twenty times its weight. Magnesia is

now also used as a basic lining. Messrs. Ramdohr, Blumenthal & Co. ship their magnesia to Messrs. Vygen & Co., of Duisburg, who make magnesia bricks which are said to be very hard, sharp, and refractory, and have a density of from 2·9 to 3. No sintering material is necessary for these bricks when burnt at a white heat.

THE GERMAN PIG-IRON PRODUCTION IN 1882.—The following return, showing (in units of 1000 kilos.) the production of the German blast-furnaces for 1882, has been compiled by the German Association of Iron and Steel Manufacturers, and published in the *Stahl und Eisen:*

	Forge pig.	Spiegel.	Bessemer pig.	Foundry pig.	Estimated work.	Total of pig-iron.
January	159,451	12,080	68,327	26,859	18,500	285,217
February	148,155	11,599	58,109	19,237	4,500	241,600
March	164,624	10,707	57,024	18,582	5,500	256,437
April	146,409	12,108	57,634	19,939	5,800	241,890
May	152,383	12,805	57,737	17,676	2,700	243,301
June	150,084	15,725	56,078	20,148	4,700	246,735
July	178,723	9,649	57,382	19,279	2,100	267,133
August	175,480	12,412	61,791	19,663	2,100	271,446
September	172,145	12,448	62,145	22,891	3,100	272,729
October	187,427	10,180	62,152	21,691	2,500	283,950
November	175,809	8,420	64,694	23,238	4,600	276,761
December	170,286	11,381	70,592	29,399	2,100	283,758
Total	1,980,976	139,514	733,665	258,602	58,200	3,170,957

PILE-DRIVING BY DYNAMITE.—In the course of executing some municipal works at Buda-Pesth, the piles already driven were required to stand a greater load than had been originally contemplated. It was, therefore, necessary to test them, and drive still deeper those that yielded. On account of the expense of bringing a pile-driving machine successively over each pile for so little work, it was determined to try the effect of dynamite; and the city engineers applied to Colonel Prodanovic, of the Second Regiment of Austrian engineers, to carry out the experiments. According to the *Wochenschrift des Oesterreichischen Ingenieur and Architekten Vereins*, the piles were cut square, and a wrought-iron plate 15 inches in diameter and 4⅜ inches thick was placed on the top of each. On its center, and immediately over that of the pile, was placed a charge of No. 2 dynamite, in the form of a cake, 6 inches in diameter and ¾ inch thick, and weighing 17½ ounces avoirdupois. This was wrapped in parchment-paper, covered with clay, and fired. The effect produced was found on an average to be equal to five blows from a 14¾ cwt. monkey falling from a hight of 9 feet 10 inches. The iron plates stood from twenty to twenty-four explosions. The system is not considered applicable to a pile standing considerably out of the ground, but saves a great expense when piles already driven have to be sunk deeper. In this country, gunpowder has been used for many years, particularly in Philadelphia, for pile-driving, though employed generally to drive the monkey upward.

AN AUSTRIAN WIRE ROPE TRAMWAY.—A description has recently been given in the German technical press of a wire tramway in connection with the coal-mining industry established near the Hersteigg, the products of which it brings to the main line belonging to the Southern Railroad of Austria. In its alternating rise and fall during its distance of 3000 yards, there is a useful excess of incline of about 142 yards, which, it is said, suffices to keep the line in self-acting working, after it has been started by means of the twelve horse-power engine provided for that purpose. When there is no return load to be sent to the mine, the speed of the line can be regulated by a brake. Under these circumstances, the cost of working the line is estimated at about 4½ cents per ton of coal. In its general arrangement, the tramway forms a straight line, and consists of two drawing ropes and the train rope. The line which is used for conveying the coal to the station is 1·10 inches thick, and is composed of 19 steel wires, each ·18 of an inch in diameter. The line on which the coal buckets are returned to the mine is only ·66 of an inch thick, the 19 steel wires of which it is composed being only ·13 of an inch thick. Both ropes consist of wires about 765 yards long, coupled to each other, and for the ropes a breaking strength of 73 tons per square inch section is guaranteed. At the ends of the ropes, weights of 5 and 3 tons are applied in the usual way for obtaining the proper tension. The distance between the seventeen supports varies from 60 to 400 yards. The train rope is ·6 of an inch thick, and consists of twelve soft steel wires of ·07 of an inch diameter, and runs at a speed of about 1⅛ yards per second. The buckets which convey the coal follow each other at a distance of about 83 yards; thus thirty-six are always on the way to and the same number coming from the station. Each bucket contains about 10 bushels, or about a quarter of a ton of lignite, the total quantity carried per hour being about 17½ tons. The cost of the line was about $14,000.

FURNACE, MILL, AND FACTORY.

The Vulcan iron-works, in Carondelet, opened February 19th, after having been closed for some months. The managers have been quietly securing non-union men, and this morning had engaged a sufficient number to begin work again.

The blast-furnace and rolling-mill of the New York & Ohio Iron and Steel Company, at Ironton, Ohio, are advertised for sale at public auction, March 1st, 1883, unless previously sold. A minimum price of $62,500 has been set on each mill.

The Ashland furnace has been compelled to cease operations for the present, on account of high water.

The Falcon furnace, Youngstown, Ohio, has been blown in, the repairs having been completed.

The Ohio Powder Company is making 250 kegs of powder per day and running the machinery day and night to keep up with its orders.

The Forsyth scale-works have received an order for a forty-ton extension track scale for the Jacobs & Hazleton Coal Company, and a similar order from the Clark & Price Coal Company.

The rolling-mill of the Reading Iron-Works has started up again on both night and day turns, thus giving employment to about 300 men. The sheet-mill of the Reading Iron-Works has indefinitely suspended work, throwing 300 men out of employment. Dullness in trade is assigned as the cause. The wages of puddlers and heaters in the neighboring mill have been reduced a dollar a ton.

A company with a capital of $35,000 has been established at Lynn, Mass., to manufacture sheet-copper, iron, and tin ware.

The Junction Iron Company, situated at Mingo Junction, Jefferson County, Ohio, has recently enlarged its plant, which at present consists of two blast-furnaces and one nail-mill. Furnace No. 1 has been in blast, averaging 80 tons of iron per day, but was blown out last week. The nail-mill has resumed work.

It is reported that Furbush's iron foundry, Camden, N. J., will soon resume operations.

Starr's iron-works, Camden, N. J., which shut down previous to their sale, will resume work, the sale having been postponed. The works have a capacity of 1000 hands.

The Laclede rolling-mills, of St. Louis, have shut down on account of dullness of trade, throwing 600 men out of employment.

Fayette Brown, of Cleveland, Ohio, has been appointed receiver of Brown, Bonnell & Co., on the application of the Jackson and Lake Superior Iron and Mining companies and the Negaunee Concentration Company. They have claims amounting to $30,000. Mr. Brown said he expected that the Youngstown works would be shut down and an inventory taken, after which it would be managed so as to make the most out of the property. The company represents that it has a large quantity of stock on hand and good contracts, and that its assets are largely in excess of its liabilities.

J. V. Ayres's Sons, dealers in iron and steel, Chicago, have suspended. The liabilities of the firm are reported to amount to more than $1,500,000. This firm held a large interest in the iron-works of Brown, Bonnell & Co., at Youngstown, Ohio.

The Excelsior iron-works, of Chicago, Ill., under the direction of the Pacific Iron-Works, of San Francisco, are building a 30-ton copper-smelting plant for the H. O. W. Copper Mining Company, of Deadwood, Dakota.

New foundations for the recently destroyed plant of the Chicago Smelting and Refining Company are laying. The buildings will be 120×220, with blast-furnace 60×60. Some new machinery will be added, and it is expected that the works will be ready to receive and refine bullion May 1st.

The Quinnimont furnace and property were recently sold for $150,000.

A Northern company has purchased the iron bed near Rome, Georgia, and another blast-furnace is to be erected.

The reported failure of the Chicago & Carp River Iron Company of Marquette, Mich., and the statement that it had given every thing up to creditors in general assignment, are authoritatively denied. Mr. Charles H. Himrod, agent for the company, states that the company had difficulty, but will come out all right. The situation had been complicated by the failure of the Union Fuel Company, of Marquette, in which it was interested, and this had given rise to the report.

It is reported that the Fox River Iron Company of Greenbay, Wis., has assigned. Capital, $200,000; assets, $90,000; liabilities, over $65,000.

A dispatch says that the furnace of the Wampum Iron Company, at Wampum, Penn., was closed February 21st by the sheriff on a confessed judgment of $20,000. The failure was brought about by the recent financial difficulties of Kloman Brothers, Pittsburg.

The Pittston stove-works started work February 21st with new men. This gives employment to a large number of men and boys. The molders here have been on a strike since January 1st.

The Colebrook furnaces, at Lebanon, Pa., during the week ended on the 10th instant, largely exceeded their former best record. The daily product of these furnaces for the week was as follows, in tons of 2250 pounds:

February	4	5	6	7	8	9	10	Total.
No. 1 furnace	85	85	84	91	94	94	93	626 tons.
No. 2 furnace	82	72	86	83	86	75	97	581 "
Total								1,207 tons.

The fuel used per ton of pig-iron made at No. 1 furnace was 924 pounds of anthracite coal and 1582 pounds of coke; total, 2506 pounds. The fuel used at No. 2 furnace was 802 pounds of anthracite coal and 1605 pounds of coke; total, 2407 pounds.

GENERAL MINING NEWS.

ARIZONA.

The Peabody mine, at Russellville, has been sold to the owners of the Clifton mines, a Scotch company, for about $300,000.

COCHISE COUNTY—TOMBSTONE DISTRICT.

Late dispatches state that the Ingersoll hoisting-works started up three days ago, and the Stonewall hoisting-works started up yesterday. Both work admirably. The suit of the Town-Site Company against the Vizina, for surface ground, is now in progress at the District Court. The blackmailing suit against the Grand Central Company is reported to have been compromised for $3000. The Contention 300 level is looking better than ever before. There is enough ore in sight to supply the mill for ten months. Assays average $90 per ton. Strata of ore have been struck in the Big Pedro mine which assay $1800 per ton. A suit for one half of the Last Chance mine is in progress in the District Court.

GRAHAM COUNTY—CLIFTON DISTRICT.

COPPER QUEEN.—Reports state that a suit has been brought by O. Bear against this company to recover one ninth of the mine and its product. The suit involves several million dollars.

CALIFORNIA.

AMADOR COUNTY.

BUNKER HILL.—This company, after running through the supposed foot-wall of its mine, struck a ledge of good ore 5 feet wide.

MONO COUNTY—BODIE DISTRICT.

BODIE CONSOLIDATED.—During the week ended February 15th, 126 tons of ore were crushed; average assay value, $36 per ton. The east cross-cut, 1000 level, is in 269 feet. The rich vein in the north drift, 780 level, has split up, and the drift has been stopped at a distance of 48 feet from the cross-cut.

STANDARD CONSOLIDATED.—During the past week, 1406 tons of ore were crushed. The east cross-cut from south drift, 1000 level, is in 285 feet. South drift from east cross-cut, 700 level, is 416 feet long, and the vein in the face is 2⅛ feet wide. The vein in the stopes from the upper levels is from 7 to 12 feet wide. At the annual meeting of stockholders, the following officers and directors were elected for the coming year: President, Thomas Bell; Vice-President, W. S. Wood; Treasurer, the Nevada Bank; Secretary, William Willis; Superintendent, William Irwin; Directors, Thomas Bell, Thomas Brown, William Willis, R. H. Laimbeer, M. R. Cook, and John H. Boyd.

PLUMAS COUNTY—GREENVILLE DISTRICT.

The Greenville *Bulletin* reports as follows:

CRESCENT.—The work of prospecting is going on with much vigor, and a very large amount of ore is brought in sight in the different ledges. When spring opens, there will be enough in sight to supply the full milling capacity for a long time.

TAYLOR-PLUMAS.—About fifty tons of ore were crushed in the new mill, and from this a partial clean-up was made of bullion to the amount of seven hundred dollars; the ore crushed was a miscellaneous mixture, taken from all parts of the mine. In the mine, the winze is now down about fifty feet; the many stringers have all run into the main ledge, which is now about five feet wide, and looks very well; at this depth, a drift will be started east to develop the ledge, and should its present appearance be maintained there, a shaft will be sunk close to the mill through which the ore will be hoisted and run directly to the battery.

CANADA.

NEW BRUNSWICK.

QUEEN MANGANESE MINE.—A shipment of 212 tons of ore, valued at $3392,

was recently made from these mines, at Markhamville. It is reported that the mines produce almost all grades of ore, from that worth $16 a ton to ore worth $100.

COLORADO.

CHAFFEE COUNTY.

CALUMET.—The incline sunk on the original discovery is now down about 319 feet, pitching at an angle of about thirty degrees. From this incline, levels have been run at 100 and 200 feet both ways. At the 100-foot level, the vein shows a body of very fine iron ore, over thirty feet wide. The ore is magnetic iron, similar to that found in the Lake Superior region. The company began operations two years ago, and for about half of that time have been engaged exclusively in development-work. A force of about fifty men is at present engaged working two shifts, only a small proportion of which are stoping, yet the daily output of the mine is 100 tons. At the 100-foot level, the northeast stope is a huge chamber, the walls and bottoms of which are almost solid ore. The heading is advanced about 100 feet from the incline, and ore has been stoped the whole width of the vein, over thirty feet, and taken out overhead to a hight of over twenty feet. The 100-foot level shows the finest body of ore, and is at present the main source of supply for shipping. All the timbers required for the mine are let down the incline to the two levels, and the ore is dropped from the 100-foot level to the 200-foot or tunnel level by means of a chute, thus avoiding all expensive hoisting machinery. The 200-foot level connects with the surface by a cross-cut tunnel. At a point about 200 feet from the mouth, the vein is cut and lateral drifts have been started in the shape of a Y, for the purpose of developing the main ore-body. The ore appears to be somewhat scattered in the 200-foot level, though the impression is, that it will be found solid in the north drift.

CLEAR CREEK COUNTY.

MINT.—The contract has been let to drive a 200-foot adit on the company's property, on McClellan Mountain. The property consists of a net-work of half a dozen lodes, all of which can be worked through the adit now driving. A great deal of rich float-ore has been found on this mountain, and it is the general belief that the company has property in which will be tapped the original source of some of this float.

GILPIN COUNTY.

A correspondent of the Central City *Register-Call*, in speaking of the mines on Quartz Hill, says: On the westerly boundary-line of developed veins, the Forks was worked, the depth of the main shaft being over 900 feet. The ore raised does not differ materially in its appearance from that taken out of the Hidden Treasure, which in its lower workings—1300 feet—has been developed into pay. The Kansas-Monmouth formerly—now operated by the Denver Company, Limited—employs forty stamps on Kansas and Kent County ore, with profitable results. Working out in a southeasterly direction, the Phœnix-Burroughs and Mackey-Burroughs were reached. Work continues at the workings of these properties, both on the same vein. At the Roderick Dhu, sinking the main shaft is continued below a depth of 600 feet. At the Illinois, sinking is going on without any material change. South of the Illinois, the main shaft of the Ingalls is in proper shape for deeper workings. A new shaft has been erected which incloses a stationary engine and boiler of about 25 horse-power capacity. At the Egyptian, development-work is progressing. The output of the California mine furnishes the mill ore for fifty stamps, enough now remaining on the stulls to keep fifty more stamps running. On the summit of Quartz Hill, the Pyrenees shows gold-bearing ore—milling and smelting—although the latter quality is of a galenous character. The Aurora Company, on the southerly slope of Quartz Hill, outside of timbering the main shaft over the Charter Oak lode, and the erection of a shaft building, has accomplished but little, it being late in the season when it began operations. Sinking is continued.

BARKER.—Work has been commenced on this lode, situated west of the Kent County mine. A shaft 80 feet in depth has been cleaned out and timbered up wherever needed, and sinking resumed. The east and west levels are driving through a good body of ore. The crevice-matter in the bottom of the shaft is of uniform width, and as depth is attained it improves.

GUNNELL.—The production for the month of January was as follows: Smelting ore sold, $10,029.70; mill gold, $2229.15; tailings, $147.55; total product, $12,406.40.

HINSDALE COUNTY.

CROOKE MILLING AND SMELTING COMPANY.—The west drift of the 7th level of the Ulé is under cover 15 feet and the east drift 18 feet. Ore-body heavy and rich. The winze in east of drift on 6th level is down 56 feet in same body of ore as found in shaft. The concentrator is running on the dumps and doing splendid work.

MICHIGAN.—Shaft 7½ feet at the end of a 55-foot drift. On the hanging-wall there are 20 inches of gray copper, much of which is crystallized pyrites of iron and copper. There is a foot of vein-matter following this mineral, and then 12 inches of gray copper streak. The vein is larger and better defined than heretofore.

LAKE COUNTY.

Late Leadville exchanges contain the following:

DUNCAN.—Shipments will soon be begun. Drifts are driven to open up undeveloped territory and otherwise thoroughly explore the remaining portion of the ground.

IRON SILVER.—The Mayor shaft has attained a depth of 186 feet. The water increased to such an extent during the past few days that a suspension of work followed, and the shaft is now idle until large pumping machinery can be provided.

LEE BASIN.—The shaft-house, recently destroyed by fire, is to be rebuilt immediately.

LITTLE SLIVER.—The mine has now an output of ten tons per day, yielding a net value of about $1000. The ore in the Sliver is principally a flint, the pores and cleavages of which are filled with a chloride of silver. To all appearances, it is the same character of mineral found in the Robert E. Lee mine, and in some instances it is fully as rich in chloride of silver.

MAGNOLIA.—This property, adjoining the Henriett, worked under a lease, is showing up well at present. An eight-foot body of carbonates and iron ore is opening. Shipments will begin shortly.

ROBERT E. LEE.—In the suit of Mrs. Seymour Rogers against the Robert E. Lee Mining Company, a compromise was effected this week, the terms of which have not been made public. The case has excited much interest in this State, having been in the courts since April, 1880. Lately the decisions have been in favor of the company, and the compromise may doubtless be attributed to this fact.

PUEBLO COUNTY.

MADONNA.—The location for this company's smelter at Pueblo has not yet been definitely arranged; negotiations for land are now pending. The smelter will be supplied with four large furnaces, and will be under the management of Mr. Anton Eilers, formerly of the Arkansas Valley smelter, of Leadville.

SUMMIT COUNTY.

ROBINSON.—All work, says the Denver *Tribune*, has been resumed at the mine, and a full force of men is engaged. Guards are retained over the works, and care is taken that none of the persons opposed to the present management is admitted.

DAKOTA.

FATHER DE SMET.—The report of the superintendent from February 1st to February 8th shows ore extracted from first, second, and third levels, 1730 tons. Ore milled, 1680 tons. Water short from 3d to 7th inst. Third level, header advanced 9 feet. Header in 128 feet. Italian winze advanced 8 feet. Winze down 41 feet. We have resumed work on North End tunnel, commencing at a point about 25 feet back from face, and 790 feet from mouth of tunnel, turning and following the vein in a southeasterly direction. It has advanced 15 feet. Tunnel in 805 feet.

H. O. W. COPPER COMPANY.—This property is reported to be the only copper mine opened in the territory. The ore-body is said to be enormous, the uncovered portions of the veins being upward of sixty feet wide, averaging 16 per cent of copper. By assorting the ore, the present smelter of 30 tons daily capacity can be kept in constant blast on 30 per cent ore. The ores are mostly carbonates and oxides, entirely free from sulphur.

GEORGIA.

The Dahlonega *Signal* says:

BARLOW.—The formation is very soft at this mine, and caving is constantly going on, which keeps the cut full of ore and the mill well supplied without any extra efforts.

COLUMBIA.—The mine is shut down, but will doubtless resume operations shortly.

CONSOLIDATED GOLD MINING COMPANY.—The twenty-stamp mill is crushing ore from the Ivey cut. Work on the new sixty-stamp mill will be resumed before a great while. The cut at the Bast mine is widening and extending northeastward. The quartz leads lying back of the sandstone, quartz, and conglomerate ores are prospecting, with satisfactory results.

SINGLETON GOLD MINING COMPANY.—The twenty-stamp water-power mill at the Lockhart mine will soon be ready for operation. The little mill is making very good time on ore from the stope on the seven-foot vein.

IDAHO.

BANNER.—A correspondent of the Idaho *Statesman* states that while driving the tunnel two ledges were struck. The first ledge is the one on which the shaft was sunk to the depth of 104 feet last winter; the second is the one the uprise is making on this winter. The rise is now up about 50 feet: it will have to be extended 20 feet farther up, and then there will have to be a drift run north to intersect the shaft. The assays made give good results.

EMPIRE STATE.—This mine is now worked by Chinamen. At present, a drift is running on the vein, to connect with the old shaft and winze. The miners have run to within 48 feet of the winze and have encountered very rich ore in the face of the drift. Two hundred and twenty-eight feet more are to be run before the old shaft is struck. Good ore was found in the shaft as deep as it was sunk, and fine ore is to be found in the bottom of the winze, which is 82 feet deep. The distance from the old shaft to the north winze is 180 feet, and rich ore is known to exist between these two points for the entire distance. When the drift reaches the shaft, there will be a pay-chute 228 feet long by 82 feet high. As soon as the drift reaches the winze, stoping will be commenced.

FAR WEST AND DAVITT MINES.—These mines, situated on Deer Creek, were recently sold for $40,000.

MAYFLOWER.—The Wood River *Times* states that the lower level, which is in 270 feet, continued so long in porphyry that the superintendent started miners at work 70 feet from the breast, toward the mouth, at cross-cutting, and recently the ore-body was cut as rich as in the upper workings.

MAINE.

SULLIVAN.—Good progress at the mine is reported. The perpendicular shaft is nearly 400 feet in depth, and is going down at the rate of eight feet per week.

MINNESOTA.

Messrs. S. P. Ely, of Marquette, and George H. Ely, of Cleveland, have united in the purchase of an interest in the Minnesota Iron Company's mines, Vermilion Lake District. According to the Marquette *Mining Journal*, this purchase was made after a visit of inspection to the mines by the first-named gentleman last month, which fact is a high indorsement of all that has been said concerning this new iron field. Analyses of Vermilion Lake ore, made from a hundred samples taken from the Minnesota Iron Company's three mines, gave 67·70, 68·51, and 69·30 per cent of metallic iron, and from ·030 to ·078 of phosphorus. That ore will pass inspection anywhere.

MONTANA.

LEXINGTON.—In a communication to the Salt Lake *Tribune*, Mr. Medhurst, general manager, says that the shipments of bullion from the Lexington Mining Company for the month of January amounted to $89,049.66. The new mill having been shut down in the beginning of the month about thirty-six hours, in order to make repairs, necessary by a continuous run of over one hundred days, caused the output for January to run about $4000 under the average output of the previous three months. The average chlorination for January was 86 per cent, and the average amalgamation for the same month was 97·7 per cent, from which figures you will perceive that the Stetefeldt furnaces continue to work most satisfactorily.

NEW MEXICO.

The copper furnace in the Hubbs smelter is up and ready for work. The Albuquerque *Journal* says that owners of copper ore are requested to correspond with C. L. Hubbs. He will pay the highest cash value for copper ore on delivery at the smelter.

TREASURER.—This mine has a tunnel 20 feet in length, and the vein is 12 feet in width. The ore is pyrites of copper, and will average about 15 per cent, 12 feet from the surface.

NEVADA.

ALEXANDRIA.—Work is actively pushed. The new hoisting-works are completed on the Diligence shaft, and the engine is in its place. A force of men is engaged retimbering the shaft preparatory to sinking.

EUREKA CONSOLIDATED.—The Ruby Hill *Mining News* says that the prospects for a body of ore are very flattering at the old Wintzel works. A favorable formation has been passed through, consisting of soft lime with large boulders of hard lime at every few feet. The drift is now in broken limestone, with large crevices in the face, from which a current of air is issuing.

TUSCARORA.

NORTH BELLE.—The shaft has reached a depth of nearly 300 feet.

UTAH.

A dispatch from Salt Lake City says that a new company has been organized in London to work the famous Emma mine, which is now said to promise well. The articles of association have been filed with the secretary of the territory. The capital is £700,000 in £10 shares.

GERMANIA.—According to the *Tribune*, the operations in manufacturing lead have already made a material difference in the shipments of lead, and this difference will become more and more apparent to the great advantage of the country. These lead-works are now in full tide of successful operation.

MAMMOTH.—Capt. John W. Plummer has assumed entire control for Mr. Butler Johnston, as manager of all the property of this company, which includes the Mammoth mines (recently purchased), the smelting-works, etc.

FINANCIAL.

Gold and Silver Stocks.

NEW YORK, Friday Evening, Feb. 23.

The mining market this week has been rather quiet; but this is due, in a great measure, to the holiday. Considerable strength has been shown by the better class of stocks, and the general market may be said to have been steady, with a tendency to stronger prices.

The chief interest in the market has been the stock of Horn-Silver, which has grown very strong. Reports from the mine state that it is now looking better than for a long time past. Sierra Grande has also shown considerable strength, but evidently under manipulation. The Comstocks show little change in prices, while the Leadville stocks have been steady throughout. The Tuscaroras show a slight decline, especially Navajo. Sonora Consolidated continues to occupy most of the attention of the market, and continues to grow stronger, under manipulation. We give a summary of the market below. The total number of shares sold at all the Exchanges aggregates 404,410, as against 501,725 last week.

The Comstock shares have been quiet at irregular prices. California had a small business at irregular prices, selling from 26@21@23c. Consolidated Virginia was irregular, with a moderate business, and sold from 63@53@58c. Sierra Nevada was quiet and weak at $4.25@$3.55. Union Consolidated had a moderate business at irregular prices, but closed strong; it sold from $4@$5. Ophir sold to the extent of 400 shares, at $3.25@$2.90. Best & Belcher records a small business; it sold from $4.75@$4.38. Sutro Tunnel was active and steady selling from 21@25@22c.

The Leadville stocks had a fair business and have been steady. Amie sold from 21@22c. under a very active business. News from the mine states that the lessees of No. 3 shaft are shipping about 100 tons of ore per day, averaging from 50 to 75 ounces of silver to the ton, that there is more ore in sight than can be extracted before the lease expires, and that no development-work has been done by the lessees for some time past. Chrysolite has been very quiet and steady, selling from $1.40@$1.45. Hibernia sold from 3@5c. under a small business. Iron Silver was strong, and had a fair business; it sold from $2.80@$2.85. Leadville records but one transaction, and that at 70c. Little Chief was quiet and steady, selling at 42@40c. Little Pittsburg was also quiet and steady; it sold from 63@66c. Big Pittsburg sold at 20@19c.; this company has been reorganized. Climax had a fair business at steady prices, selling at 8@9c.

The Bodie stocks were very quiet and showed signs of weakness. Bodie Consolidated sold from $1.80@$1.70, with a small business. Standard was quiet and steady; it sold from $5⅝@$6, with a business of 385 shares. Bulwer had a fair business, and was a little weak; it sold from $1.05@97c.

The Tuscarora stocks were quiet and steady. Grand Prize was quiet and steady at 60@62c. Navajo declined from $6⅝@$5½ under a business of 1600 shares. Independence sold at 70c. North Belle Isle records a small business at steady prices, selling at 55@63c. Elko Consolidated continues active, but has declined from its recent strong prices; it sold from 9@13@12c.

In the miscellaneous list, Alice has had a moderate business at strong prices, and has sold from $2.90 @$3.55. Bassick has declined from its strong prices of last week, selling from $9@$8¼@$8⅛ under a small business. The Green Mountain stocks have been quiet and weak. Gold Stripe sold at 8c. Green Mountain declined from 80@69@70c. under a small business. Rising Sun sold at 8c. and Cherokee at 6c. Hall-Anderson has had a fair business, but has been weak; it sold from $1.75@$1.55@$1.60. Horn-Silver has been very strong, with a fair business, selling from $5⅝@$7⅝@$6⅞@$7⅛. Ontario has been quiet and very irregular, selling from $25@$20@$24½. Robinson Consolidated has been very active at irregular prices; it sold from $1.05@$1.25@$1.10. Sierra Grande has gained considerable strength under a very active business; it sold from $2.65 @$3.50, closing at $3.25. It is reported that the mine is now producing from 6000 to 10,000 ounces of silver, and that the total output for six months from July 21st, 1882, to January 5th, 1883, was $869,138.88. Silver King has been quiet and irregular, selling from $11¼@$10¾@$11⅛.

Alta-Montana records an active business at irregular prices, selling from 9@11@15c. Bradshaw was quiet and irregular at 34@31@32c. Decatur records a very active business, and has been steady; it sold from 12@10c. Harlem M. & M. Co. had a fair business at steady prices, selling from $1.15@$1.20. Oriental & Miller was active and steady, selling at 15 @13@14c. Red Elephant records a moderate business at steady prices, selling from 7@8c. Silver Cliff was irregular, under a small business, and sold from 37@42@39c. Sonora Consolidated was very active, and has grown stronger; it sold from 28@34c. South Pacific was active and a little weak at 8@6c. The State Line stocks have been moderately active at weak prices; Nos. 1 and 4 sold from 4@3c., and Nos. 2 and 3 from 8@7c. Taylor-Plumas has been active and irregular, selling from 18@16@17c.

It now looks as if the days of the American Mining Stock Exchange were numbered. The Mutual Trust Company, which acts as financial manager and cashier of the Exchange, recently informed the members that they would be required to pay dues to the amount of $100 by the 1st of March or lose their seats. This notice has caused widespread consternation and alarm. There has been little or no business done at the Exchange for a long time past, but the sales of the day appeared (on paper) as large, and sometimes larger than that of its opponent, the New York Board. It will no doubt help speculation in mining stocks to have the business centred in one exchange, and the quicker it is placed in that one exchange, and in good, reliable hands, the better.

The Big Pittsburg Mining Company has been reorganized and a new company formed, under the name of the New Pittsburg Mining Company. The capitalization has been fixed at 200,000 shares of the par value of $10, and the shareholders of the old company can exchange their stock for that of the new by surrendering their stock and an additional payment of twenty-five cents per share. The gentlemen forming the new company are W. Van Norden, who is the President, Walter S. Gurnee, R. H. Laimbeer, George R. Blanchard, Joseph S. Decker, William N. Cromwell, and J. F. Alexander. The new company has purchased the property of the Big Pittsburg, and it is going to start work immediately. It states that it believes it is a good mining property, but has never been properly worked; that it remains to be seen what there is in it; but it has strong hopes that the results will justify the outlay.

The Board of Directors of the Tombstone Mill and Mining Company, at their meeting in Philadelphia, on the 20th inst., directed the payment of another installment of twenty-five thousand dollars ($25,000) on their funded debt, being from the proceeds of their tailings. The officers were also directed to prepare reports for the approaching stockholders' meeting.

MEETINGS.

Crooke Mining and Smelting Company, No. 234 Broadway, Room 34 New York. Annual meeting and election of trustees, March 6th, at eleven o'clock A.M.

North Star Mining and Smelting Company, No. 234 Broadway, Room 34, New York. Annual meeting and election of trustees, March 6th, at one o'clock P.M.

Robinson Consolidated Mining Company, No. 54 William street, New York. Annual meeting and election of trustees, March 6th.

DIVIDENDS.

The Father de Smet Consolidated Gold Mining Company, of Dakota, has declared dividend No. 26, of twenty cents a share, payable at the office of Laidlaw & Co., No. 14 Wall street, New York, on February 28th. Transfer-books will close on February 21st.

The Sierra Grande Mining Company, of New Mexico, has declared a dividend (No. 5) of $100,000, or twenty-five cents per share, payable March 3d. Transfer-books close February 24th, and reopen March 5th.

PIPE LINE CERTIFICATES.

Messrs. Watson & Gibson furnish the following *résumé* of the petroleum market for the week:

There has been no special feature to speculation during the week, and the volume has been light and fluctuations small. It is said that the oil certificates are scarce in Oil City, but they are plenty in the New York market. The only inference from this would be, that the New York public believe in higher prices and are absorbing the certificates, and that Oil City speculators have sold short on the late spurts. Many of the most successful traders "buy on slumps and sell on jumps." There have been several small wells opened in the Forest County tract, but the territory there is so spotted and irregular that no great hopes are entertained of finding large and permanent producers. We said last week that prices for a few weeks would probably hover about the dollar mark. We believe that the best informed traders as a rule are buying rather than selling at to-day's prices, say, $1.00½, but the market is dull. A movement looking to the consolidation of the Petroleum Exchange and Mining Stock Exchange is in progress, and if this can be accomplished, New York will certainly control speculation in oil within a few months.

The following table gives the quotations and sales at the New York Mining Stock Exchange:

	Opening.	Highest.	Lowest.	Closing.	Sales.
Feb. 17...	$1.01⅜	$1.01¾	$1.00⅝	$1.01	368,000
19...	1.01½	1.01⅝	.99⅞	1.00⅝	399,000
20...	1.00	1.01½	1.00	1.00½	383,000
21...	1.01	1.01	1.00¼	1.00⅜	199,000
22...	...	...	...	...	...
23...	1.00½	1.00⅞	.99	.98⅞-99	380,000
Total sales.					1,729,000

UNLISTED QUOTATIONS.

Mr. Alexander C. Lassen, 61 Broadway, under date of February 23d, three P.M., reports the current quotations of unlisted stocks as follows:

	Bid.	Asked.		Bid.	Asked.
Bodie Tunnel...	$0.25	$0.75	Mack Morris...	...	$0.75
Breece...	.17	.19	Madre...	$0.50	2.00
Batopilas Pref..	9.00	24.00	Moulton...	...	4.00
Calif'rnia Wat'r	.25	...	Native Silver...	...	.30
Contention...	3.00	8.00	Pelic'n & Dives	...	.50
Dahlgren...	.40	.85	Plata Verde...	...	.25
Denver City...	.18	.20	Rico...	...	.55
Empire Gold...	3.00	...	Hond...	...	7.00
Eureka Tunnel.	.60	.90	Santa Maria...	.20	1.00
Evening Star...	2.00	...	Silver State...	...	1.10
Gold Cup...	.10	.14	Stormont (New)	.20	.30
Grand Central..	1.50	...	Sampson...	.35	...
Highland Chief.	.10	.25	Silver Cord...	1.15	1.35
Hibernia Silver, (New)...	...	.19	Satemo...	.35	.70
Jocuistita...	5.00	7.00	Sierra Apache..	.30	.32
London Cons...	.90	1.35	Sierra Bella...	.70	.75
			Terrible...	1.50	2.00

REVIEW OF THE SAN FRANCISCO MARKET.

There is no news of special interest from the San Francisco market. Business has been dull, but prices have been firm. The north-end Comstocks have been in good demand at strong prices. The Tuscaroras remain steady.

SAN FRANCISCO MINING STOCK QUOTATIONS.
Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS. Feb. 16.	Feb. 17.	Feb. 19.	Feb. 20.	Feb. 21.	Feb. 22.
Albion	...	...	...	...	...	...
Alpna	1	...	1¼	...	1⅛	...
Alta	...	...	11-32	13-32	13-32	...
Bechtel	...	...	...	...	...	...
Belcher	...	...	1/8	...	...	...
Belle Isle	21-32	...	21-32	19-32	19-32	...
Best & Belcher	4⅜	...	4⅛	4⅛	4½	...
Bodie	1⅜	...	1¾	1¾	1⅞	...
Bullion	...	...	...	...	...	...
California	3-16	...	¼	3-16	3-16	...
Chollar	...	...	...	...	...	...
Con. Virginia	9-16	...	9-16	½	19-32	...
Crown Point	...	...	27-32	13-16	...	...
Elko Cons	...	...	5-32	3-16	...	...
Eureka Con	9	...	...	...	9	...
Exchequer	¼	...	¼	¼	¼	...
Gould & Curry	2⅞	...	2⅞	2¾	3	...
Grand Prize	9-16	...	9-16	19-32	21-32	...
Hale & Norcross	2¾	...	2¾	2⅝	2¾	...
Independence	...	...	¾	11-16	11-16	...
Martin White	2	...	1¾	1½	1¼	...
Mexican	3	...	2⅞	2¾	3	...
Mono	...	...	...	¼	¼	...
Mount Diablo	...	...	...	...	3¾	...
Navajo	5¾	...	5⅝	5½	5½	...
Northern Belle	9	...	8⅜	9½	9⅝	...
North Belle Isle	...	...	9-16	...	...	...
Ophir	3⅛	...	3	2¾	3	...
Overman	...	...	...	...	...	...
Potosi	1⅛	...	1¼	1¼	1⅛	...
Savage	...	...	...	...	...	...
Scorpion	...	...	...	...	...	...
Sierra Nev	3⅞	...	3¾	3¾	4	...
Silver King	...	...	11	...	10	...
Tip Top	...	...	...	...	...	...
Union Con.	4¾	...	4⅛	4⅛	4¾	...
Wales Con	¼	...	¼	...	5-16	...
Yellow Jacket	1½	...	1½	1½	1½	...

Copper and Silver Stocks.

Reported by C. H. Smith, 15 Congress street, Boston, Stock Broker and Member of the Boston Mining and Stock Exchanges.

BOSTON, Feb. 21.

There has been a little more activity in the market the past week, but it has been wholly confined to the four or five principal copper stocks. Prices, however, have been fairly sustained, with, in one instance, quite an advance over last week's quotations. Calumet & Hecla holds steady at $243, all the lots offered being taken at that price. Franklin opened at a decline from $123¾@$121¼, but subsequently advanced to $13, and closed quite strong at $12¾ bid. Pewabic has again come to the front and become quite

active, opening at $7½, and advancing rapidly, with but few sales between, to $9⅛@$10; closing sale to-day at $9¾. We hear no reason assigned for the advance other than that it was too low, and the low price tempted buyers. Quincy ruled steady at $50⅛@$50¾ in the early dealings, but on free offerings the price was forced down to $50, with a sale of 50 shares at $49, seller 4 months. Osceola, firm at $31@$30⅞. Sales of Allouez at $2½. The above comprise all the copper stocks dealt in the past week. The speculative list continues dull and inactive, and there is no indication of a boom in this class in the near future.

In the silver stocks, business has been unusually light. Only 20 shares of Bonanza reported at $2⅛. Catalpa and Crescent, dull; the former sold at 85@80c., and the latter sold at 37½c. Sullivan declined to 75c. San Pedro, quiet at 75@80c.

At the Boston Mining Exchange, Massachusetts & New Mexico advanced to 10c., with large sales; but the price was not sustained, and it again receded to 7@8c., closing 8c. bid. Empire is in better demand, and advanced from 20@24c. Pipe-line Certificates ruled from 99¾c.@$1.02½, with quite an active business in them.

3 P.M.—There was no feature to the market this afternoon. Business, as usual the day preceding a holiday, was generally neglected, and consequently sales were light all round. Quincy sold at $50; Harshaw, 75c.; Catalpa, 77½c.; Osceola, $31. Closing prices as follows: Allouez, $2½ bid. Atlantic, $14 asked. Antimony, $13 bid. Bonanza, $2¾ asked. Catalpa, 75c. bid, 77½c. asked. Crescent, 40c. asked. Harshaw, 75c. bid. Huron, $1¾ asked. National, $1 bid, $1½ asked. Osceola, $30¾ bid, $31 asked. Pewabic, $9½ asked. Quincy, $49¾ bid, $50 asked. Silver Islet, $5 bid. Sullivan, 75c. bid, $1 asked.

BULLION MARKET.

NEW YORK, Friday Evening, Feb. 23.

The advanced rate at which the Indian Council bills were awarded on Thursday in London has strengthened the silver market, as our rates in the accompanying table set forth; but at to-day's figures, the market abroad and here is somewhat unsettled.

DATE.	London Pence.	N. Y. Cents.	DATE.	London Pence.	N. Y. Cents.
Feb. 17	50⅛	110	Feb. 21	*	‡
19	50 9-16	109⅞	22	†	†
20	50 9-16	110	23	51	110⅞

* 50⅝@50¾. † Holiday. ‡ 110¼@110⅜.

BULLION PRODUCTION FOR 1883.

MINES.	States.	For the week.	Month of January.	Year from Jan. 1st, 1883.
Bodie, G. S.	Cal		$26,084	
Bodie Tunnel, G.	"		13,631	
Bonanza King, G.	"		61,777	
*Central Arizona, S.	Ariz.		15,627	
Christy, S.	Utah		8,987	
*Chrysolite, S. L.	Colo.		26,312	
Contention, S.	Ariz.		88,694	
Crescent, G.	Cal.		13,000	
*Custer, G. S.	Idaho		43,572	
*Deadwood-Terra, G.	Dak.		45,696	
*Derbec Bl. Grav., G. S.	Cal		8,337	
*Father de Smet, G.	Dak.		27,491	
*FriscoM. & S. Co. G. S. L.	Utah		22,671	
*Homestake, G.	Dak.		107,678	
Horn-Silver, S. L.	Utah		203,000	
Lexington, S.	Mont.		89,050	
*Little Pittsburg, S. L.	Colo.		5,107	
*Marguerite, G.	Cal		10,300	
Martin White, S	Nev.		19,407	
Moulton, G. S.	Mont.		41,005	
Navajo, G. S.	Nev		80,000	
Northern Belle, S.	"		65,174	
*Ontario, S. L.	Utah		‡182,221	
*Oxford, G.	N. S.		2,865	
*Satemo, G.	"		1,800	
Standard, G.	Cal		82,959	
Star, S.	Nev.		14,796	
Stormont, S.	Utah		19,130	
Syndicate, G.	Cal		9,217	
Tintic M. & M. Co.	Utah		7,632	
*Tip Top, S.	Ariz.		7,976	
*Tombstone, G. S.	"		72,011	
Yellow Jacket, S.	Nev.		14,252	
Total amount of shipments to date			$1,435,459	

* Official. ‡ Assay value. *G. Gold. S. Silver. L. Lead.*

Bullion Receipts at New York.—The bullion received from the mines at the various offices in this city during the week ended February 23d, as compiled from various sources, amounted to $209,130.38, as against $247,784.16 reported for the previous week. The receipts from January 1st, 1883, to date are $2,280,038.05.

Exports and Imports of Gold and Silver at New York.

Exports.

Week ended February 17th	$242,575
Corresponding week last year	1,328,157
Since January 1st, 1883	1,618,254
Corresponding period last year	7,083,177

Imports.

Week ended February 17th	$76,332
Corresponding week last year	27,129
Since January 1st, 1883	765,821
Corresponding period last year	510,261

IRON MARKET REVIEW.

NEW YORK, Friday Evening, Feb. 23.

American Pig.—Makers of standard and choice brands still stubbornly resist any effort to depress prices, and the dead-lock continues with no prospect of changing until matters in Washington have assumed a more satisfactory shape. Meanwhile, small lots of outside brands of pig-iron, chiefly from Pennsylvania, are coming into the market, and are sold for what they can bring, demoralizing the little current trade there is. It is conceded that stocks in the hands of makers are now somewhat greater than they were a year ago; but this is not, under the present exceptional circumstances, a very alarming or disquieting state of affairs. We quote $23.50@$25 for ordinary to standard No. 1 Foundry, and $22@$23 for No. 2, Gray Forge remaining unchanged at $20@$20.50, all at tide-water. Bessemer pig is dull and unchanged, both here and in England. Nothing has been done in spiegeleisen, which is nominally $32.50@$33 for 20 per cent; $26@$27, for 10 to 12 per cent.

Scotch Pig.—Importers maintain a firmer attitude, chiefly, it seems, because of the upward tendency of freights, which are now 6s. 6d. from Glasgow to this port. We are unable to note, however, that buyers are at all shaken out of their expectant attitude, and business consequently is dull and lifeless. We quote Coltness, $24.75@$25.25; Glengarnock, $22@$22.50; Langloan, $24.50@$25; and Eglinton, $21@$21.50. The Wall Street Exchange has received the following Glasgow quotations by wire to-day: Carnbroe, 55s. 3d.; Gartsherrie, 61s. 9d.; Summerlee, 62s.; Coltness, 64s. 9d.; Langloan, 65s.; Glengarnock, 55s. 3d.; and Eglinton, 49s. 6d. Warrants were 47s. 4d.

Rails.—With the exception of small sales aggregating about 5000 tons, at figures varying according to place of delivery, but equivalent to about $39 at mill, nothing has been done. Buyers appear to expect a further decline. England cables £5@£5 5s. Mr. James M. Swank's production statistics will be found elsewhere.

Old Rails.—We hear of no business worthy of special mention, and quote Old Ts, $24.50@$25; and D. Hs., $27.25@$27.50.

Scrap.—Nothing has been done. Quotations are, nominally, $25 ex ship.

Philadelphia. Feb. 23.

The iron situation in Pennsylvania has not materially changed from that detailed last week. The cause of the quietness and dullness is chiefly the pending legislation and the growing uncertainty in the minds of consumers as to the probable effects of the long agitation upon the general trade interests. The strong companies of both crude and finished iron are resting easily on their oars; but the weaker makers in both branches are full of apprehension, and very anxious that a conclusion be reached promptly. Competition has not depressed prices much during the past week, as they have already reached bottom limits at present cost of production. It is the purpose of those in charge of iron interests at Washington to throw the legislation into the next Congress, unless certain results can be accomplished in this. They feel themselves able to do this. During the past week, a large number of small transactions in Foundry iron were closed at prices varying from $24.50, delivered, to as high as $26, though the general price is under $25. The furnace companies are not over-anxious to press stocks of good iron on the market, because they believe that the accumulation in Eastern Pennsylvania is not sufficient to demand concessions, in view of the probable expansion of demand as soon as buyers can venture out. It is true, according to careful investigation, that consumption has been restricted much of late, but this has been due to a cautious policy rather than to any actual necessity. All sides have drawn in as much as possible, in order to protect themselves, and the undercurrent of opinion is, that demand will assume normal proportions just as soon as the tariff bill is placed. Correspondence from both East and West exhibits this feeling, and it is confidentially asserted in iron circles. The consumption of Mill iron has fallen to a minimum, and prices are steady at about $20.50@$21.50, although, where special brands are sold, a little higher figure has been obtained. The furnaces in the West have more iron than those in the East. Muck Bars are moving in small lots at $37. Charcoal and Anthracite blooms are selling in small lots at steady figures. Agents report the average production, which is taken up. Merchant Bars: All the mills are creeping along on their hands and knees waiting for something to happen which will induce buyers to place orders for spring requirements. Selling prices run from 2·20@2·30c. A few manufacturers have endeavored to find buyers for large lots at about 2·30c., but have failed. Ordinary irons are to be had as low as 2c. in country mills, but the average is 2·10@2·15c. Western iron has been delivered in Middle Pennsylvania at 2c., and this fact has led to the reduction in the East. It is impossible to speak with much encouragement of the immediate outlook, but the expected early termination of tariff legislation leads both manufacturers and buyers to hope that whatever activity there is hidden behind the present lull will soon manifest itself. The stocks in consumers' hands are, of course, low, and manufacturers are not willing to stock up. Inquiries for car-load lots of nails have been made, and several lots shipped West. Quotations are $3.30@$3.40, but sales have been made at less, and this fact has given rise to some complaints among Western makers of the action of Eastern men. The restrictive policy will be maintained from time to time. The Western mills began work last Monday morning for three weeks, and will then be idle two. Inquiries from consumers, both East and West, indicate an active demand for nails, and a desire to place orders at present figures before the upward tendency hardens prices. The nailmen are in good humor, and expect to do a large business. Wrought pipes and tubes are moving freely, but in small lots, at about 65@70 per cent off, and boiler tubes are in fair demand at 55 off. Manufacturers of cast pipes have received large orders in different portions of the country, and there are inquiries coming to hand for additional supplies. Bessemer pig-iron is quoted at $22.50. There are inquiries in hand for supplies, but buyers are not satisfied with terms. Bridge plate and boiler plate are purchased in small lots at concessions. Galvanized and thin sheet are in demand for early delivery, and makers are turning out enough to meet requirements. Stocks are not large. Plate irons of all kinds are dull, although the inquiries since last Monday show a slight improvement. Buyers are able to obtain concessions, and this is leading to a little more business. The undertone feeling among consumers is, that the settlement of the tariff question will stimulate trade, and those who have present requirements are now endeavoring to cover them at the low prices prevailing. The movements in the hardware trade are not of special interest, though the shipments for the past week show a little improvement over last in season goods. Steel rails are without any activity except in small lots at about $40. Rumors have prevailed of larger transactions at concessions, and it is not improbable that transactions of this kind will be brought to a close in a short time; but so far as can be ascertained, makers are not anxious to depress the market. It is said that large orders could be placed at $38@$39, though none have been heard of at this figure, and $40 is claimed to be a fair quotation. Some complaint emanates from Western railmakers as to business; and owing to the uncertainties as to foreign supplies reaching tide-water markets, they do not feel certain of an active spring trade. Double-heads are not in the market, but are quoted at $27.50. American are selling in a small way at interior points at $27@$28, according to location. Scrap is without any activity.

Cleveland. Feb. 21.

The iron and ore markets here are in a very unsatisfactory condition, from a number of causes. Overproduction in all branches has been going on for some time, and mills have been running at a loss. The uncertainty of the tariff question causes consumers to put off buying, or to purchase only in a hand

NEW YORK MINING STOCKS.

DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE.												SALES.
	Feb. 17.		Feb. 19.		Feb. 20.		Feb. 21.		Feb. 22.		Feb. 23		
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Alice, Mon.	3.00	2.90	3.05	2.95	3.50	3.10	3.50	3.40			3.55	3.50	5,200
Amie Con., Co.	.22	.21	.22	.21	.22	.21	.21				.22	.21	19,000
Argenta, Ne.													
Bar. & Walker, Ut.													
Bassick, Co.	9.00										8.50	8.25	300
Belle Isle, Ne.													
Bodie Cons., Ca.			1.75		1.80	1.75					1.75	1.70	510
Breece, Co.													
Bulwer, Ca.	1.05	.99	1.05	.97	.98		.97						8,630
California, Ne.	.26	.21					.24	.21			.24	.23	5,500
Cal. & Hecla, Mich.													
Caribou Con., Co.			.20	.18	.20		.22				.23		2,900
Chrysolite, Co.	1.40		1.45	1 40			1.45						800
Climax, Co.	.10	.08	.09										4,400
Cons. Va., Ne.	.59	.55	.63	.55			.56	.53			.58	.56	6,540
Deadwood-Terra, Dk.													
Dunkin, Co.											.26		500
Eureka Cons., Ne.	10.00						9.50						120
Excelsior, Ca.													
Father de Smet, Dk.			5.00										300
Findley, Ga.													
Gold Stripe, Ca.	.08		.08										1,800
Gould & Curry, Ne.													
Grand Prize, Ne.	.60						.62						700
Great Eastern, Dk.			.03										1,100
Green Mountain, Ca.	.78		.80	.78			.76				.70	.69	1,800
Hale & Norcross, Ne.													
Hall-Anderson, N. S	1.55		1.75	1.70	1.70		1.60				1.60	1.55	5,500
Hibernia, Co.	.04	.03	.05	.03	.04		.05						4,800
Homestake, Dk.											16.50		200
Horn-Silver, Ut.	5.75	5.37	5.50		5 50		7.50	5.50			7.62	6.87	6,215
Hukill, Co.	.16	.15	.16	.15			.16						2,000
Independence, Ne.					.70								300
Iron Silver, Co.			2.80		2.80						2.85		1,625
La Plata, Co.													
Leadville C., Co.											.70		100
Little Chief, Co.	.42	.40	.41	.40			.40						2,700
Little Pittsburg, Co.	.64	.63	.65		.66								800
Marsin White, Ne.													300
Moose, Co.													
Navajo, Ne.	6.37	6.25	6.25	5.87	6.12	5.75	5.62	5.50					1,600
Northern Belle, Ne.			9.75				9.75				10.12		170
North Belle Isle, Ne.	.55		.63										800
Ontario, Ut.			25.00	23.00	24 62	20.00	24.25	24.12					740
Ophir, Ne.	3 25	3.15					2.90						400
Plumas, Ca.													
Prussian, Colo.													
Quicksilver Pref., Ca.											41.75	41.50	200
" Com., Ca.							8.00						400
Rising Sun, Ca.	.08		.08										1,100
Robinson Cons., Co.	1.10	1.03	1.25	1.05	1.20	1.15	1.20	1.15			1.15	1.10	48,650
Savage, Ne.													
Sierra Grande, N. M.	2.75	2.65	2 95		3.00	2.95	3.25	3.00			3.50	3.00	23,850
Sierra Nevada, Ne.	3.60		4.25	4 13			3.63	3.55					1,195
Silver King, Ar.	11.25	10. 75	10.87		11 12								630
Spring Valley, Ca.													
Standard, Ca.	5.50	5.38			6.00		5.50				6.00		385
Stormont, Ut.													
Tip Top, Ar.													
Tombstone, Ar.													
Vizina, Ar.	.80	.73	.81										400
Yellow Jacket													

NON-DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE.												SALES.
	Feb. 17.		Feb. 19.		Feb. 20.		Feb. 21.		Feb. 22.		Feb. 23.		
	H	L.	H	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Advance			.03										100
Albion, s. L.													
Alta-Montana, G.	.10	.09	.11	.10			.10				.10		16,500
Am. Flag, s.													
Barcelona, G.	.21	19					.18				.18		6,700
Bear Creek													
Bechtel Con., G.			4 75				4.50	4 38					135
Best & Belcher, G. S.			.19		.20	.19							5,900
Big Pittsburg, S. L.	.20		.34	.31	.31		.31				.32		1,300
Bradshaw, S.	.34	.31											
Buckeye													
" pref.													
Bull-Domingo, S.L.													
Bye and Bye													
Calaveras, G.	.02		.02										1,200
C'lav'r's W.&M.Co.			.05										200
Cal., B. H., G.							.85						100
Carbonate Hill, S L.													
Catskill	.25												100
Central Ariz'na, S.											.35		600
Chapparal													
Cherokee, G.	.06		.06										1,800
Cons. Imp'ri'l, G.S.	.07												160
Con. Pacific, G.													
Crowell, G.							.03				.04		200
Dahlonega, G.													
Decatur	.12	.11	.12	.11	.12	.11	.12	.11			.12	.10	28,400
Durango, G.	.09		.07										1,600
Elko Cons.	.12	.09	.12	.11	.12		.13				.12		17,400
Enterprise	56	.53	.60	.55	.61	.58	.58	.56			.56	.55	11,800
Fannie Barret			2 20		2.20								300
Gold Placer, G.													
Goodshaw, G.													
Granville, G.													
Hariem M.& M.Co.	1.15		1.15		1 15		1.15				1.20	1.15	4,800
Hortense, S											.12		100
Lacrosse, G.													
Mariposa Pref., G.													
" Com., G													
Mexican, G. S.													
Mono											.25		100
North Standard, G.													
N. Horn-Silv'r, S.													
Ori'nt'l & Miller, S.	.14		.15	.14	.13		.14	.13			.14		9,700
Quartz Creek													
Rappahannock, G.													
Red Elephant, S.	.08	.07	.08	.07	08	.07					.08		5,300
Ruby, of Arizona	.57		.56		.56	.55	.56				.57		1,800
Silver Cliff, S.	.40	.37	.41	.40	.42						.39		3,100
Sonora Con.	.30	.28	.32	.30	.33	.32	.34	.32			.34		57,300
South Bodie, G.													
South Bulwer, G.													
South Hite													
South Pacific	.08	.07	.08	.07	.08	.07	.07	.06			.07	.06	10,600
State Line													
" Nos. 1 & 4, S.	.04		.04		.03		.03				.03		1,500
" Nos. 2 & 3, S.	.07		.08	.07	.08	.07	.08				.07		12,0 0
Sutro Tunnel	.23	.21	.23	.22	.23	.22	.23	.21			.25	.22	17,900
Taylor-Plumas	.18	.17	.17		.17	.16	.17	.16			.17		13,800
Tuscarora, S													
Unadilla, S.							.03				.03		500
Union Cons., G. S.	4.12	4.00	4.50		4.25						5.00		615
Vandewater			.28										1,000
Washington					.08		.10	.08					5,100

Full tables, giving the total amount of dividends, capital, etc., will be printed the first week of each month. Dividend shares sold, 165,060. Non-dividend shares sold, 239,350.

BOSTON MINING STOCKS.

	Feb. 16.		Feb. 17.		Feb. 19.		Feb. 20.		Feb. 21.		Feb. 22.		Sales.
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Allouez.					2.50				2.50				300
Atlantic													
Aztec													
Best & Bel													
Bodie Con.													
Bonanza D.	2.87½				2.75				2.75				220
Bruns. Ant.													
Bulwer													
California	.23				.23		.24						1,100
Cal. & Hec.	213		213		212½								60
Carbon. Hill													
Catalpa					.85		.82½						200
Central Ariz													
Cherryfield													
Chrysolite													
Con. V'ginia	.52		.57				.57						1,100
Copp'r Falls													
Crescent			.40	.37½					.32½				400
Cumberl'd													
Deer Isle													
Denver City													
Douglas													
Duncan													
Dunkin			.29	.28	.30								300
Empire	.21	.20			.22		.24	.23	.25	.24			4,400
Eureka Con.													
Franklin			12.37	12.25	12.62	12.50	12.62		12.75				430
Gila County													
Hancock G.													
Harshaw													
Horn-Silver													
Huron	1.75												100
Independ'ce													
Indian Q'n.													
Madison													
Mammoth													
Mass. & N.M.	.08	.07	.09		.10	.07	.09	.08	.08	.07			31,930
Milton													
Napa													
National													
North Belle													
Osceola	31.00	30.87	31.00		31.00				30.75				77
Penn-Breck.													
Pewabic			8.00	7.50	9.75	9.50	10.00						550
Pine Tree													
Plymouth					.24								200
Quincy	51.00	50.75	50.75	50.50	50.50	50.00	50.00		50.00				439
Ridge													
Robinson													
San Pedro	.75		.77½	.72½	.80								2,800
S'ra Nevada													
Silver Islet													
Silver King	11.50				11.00								75
Simpson Gd	.05		.07	.05	.07	.06	.07	.06	.06				14,100
So. Pacific													
Standard													
State Line													
Nos. 2 & 3													
Sullivan	.75						.90	.85					1,230
Sutro Tun.	.22		.22		.22								800
Sycamore													
Twin Lead.	.12		.11	.10	.11	.10	.11		.10				4,800
Vizina													

PHILADELPHIA MINING STOCKS.

	Feb. 16.		Feb. 17.		Feb. 19.		Feb. 20.		Feb. 21.		Feb. 22.		Sales.
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L	
American													
Argent	27½		27½		.30								13,400
Arizona So.													
Aztec													
Battle Mt.													
Black Sul.													
Bodie													
Buena	.06		.06		.07	.05							16,000
California													
Calista													
Cincinnati					.10								300
Comprom'e.	27½	.25	27½		.30								4,300
Dauntless	.02												1,000
Del Monte					.05								1,000
Denver City	.17		.18	.16									4,400
Fairview													
Eureka													
Girard	.18		.18										2,000
Golconda													
Golden Age													
Governor	.09		.09		.09								15,500
Grand Uni'n	.19				.19								3,300
Gunnison			.75		.70								800
Hancock													
Iowa Gulch													
King Bul'on	.12		.12		.11								15,200
Ledger Con.			.01										1,000
Little Dia'd													
Little Maud	.07		.07		.06								11,500
L'g & D'y Hl													
McCullough													
Magnolia	.01		.01										11,700
Montana			.05										100
Mt. Lincoln			.01										500
Mt. Sheridan	.05		.05		.05								6,000
National													
Orion	.07		.06		.06								1,700
Orion Pref.													
Palmetto E.													
Pembina			.18										700
Penn-Breck.	.11		.11										600
Permanent													
Pizarro													
Pizarro Ex.													
Potosi													
Rara Avis													
Rara Avis E.			.06		.07								2,100
Record													
Rico Pion'r.													
San Pedro													
Sierra G'nde	2.75	2.62½	2.68¾	2.62½	3.02½	2.85							4,210
Silver Cord													
Silv'r Plume													
Silver Rock													
Sovereign													
Standard													
Sultana	.04		.04		.04								7,600
Sutro Tun'l.													
Tombstone	32½		.85		.80								3,100
Tranquilli'y													
Tyrone													
Victor													
Yale Mt.	.11	.09	.07										1,400

to-mouth way. The large failures of late cause a feeling of distrust in the trade and a tightening of credits among the banks. We think the general foundry trade to be in good, fair condition, with prospects of plenty of work for the year, but at low prices.

The mills are not so well off, and without a large reduction in the cost of manufacture or much better price for finished iron, the outlook is dark. There have been no large sales made for some time. Trade in foundry irons in small lots is very good, and should more confidence be established and consumers purchase ordinary stocks, there would be a slight stiffening of prices, as stocks in furnace hands of good iron are small.

There is nothing doing in the ore trade. The present year's prices have not been made and probably will not be made known until stocks on docks here are disposed of. We quote :

No. 1, Bessemer	$23.50@$24.00
" 1, Foundry, all ore	22.50@ 23.00
" 1, " cinder mixture	22.00@ 22.50
" 1, Soft Foundry	21.50@ 23.00
" 1, Open silvery	20.00@ 22.00
Mill irons	19.00@ 21.50
Nos. 1 and 2 Charcoal	25.50@ 26.00
" 3, 4, 5 and 6 "	26.00@ 27.00
Hanging Rock Charcoal	23.50@ 26.00
Strictly Cold Blast	27.50@ 29.00

FOUR MONTHS, F. O. B. CARS CLEVELAND.

Bessemer ores	$8.00@$10.00
Hematite ores	6.00@ 7.50

METALS.

NEW YORK, Friday Evening, Feb. 23.

Copper.—The market has somewhat recovered, and we hear of no sales at the extremely low prices spoken of in our last. Much thought has been given to the position of the metal of late by those interested in it ; and from what we have been able togather, the feeling is by no means as gloomy as some would make it. The possibility of a more liberal export of black copper from Arizona and New Mexico, by way of New Orleans and Galveston, to English markets, is beginning seriously to engage attention, and there are those who predict that a pool of producers of Western copper will be attempted with a view to follow the tactics so long and so successfully followed by the Lake companies. It can not be denied that there are very serious obstacles in the way of such a scheme, but that something must be done is pretty generally felt. Well established brands of copper have some support against such fluctuations in the market as we have been experiencing ; but even they are unfavorably influenced, and it is better that, if the foreign market will stand it, we should get rid of a surplus there at present rates than force all the metal here down toward the export figure. Lake is weak at 17¼@17⅛c., with very little offered and very little demand. Baltimore is quoted 16¼@16⅛c. ; outside brands, 16c. ; and Arizona, 16¾c. London cables £65 10s. for Chili Bars, and £72@£72 5s. for Best Selected.

Tin.—Tin has weakened somewhat in sympathy with the general decline of the entire metal trade. Sales have aggregated from 200 to 300 tons, and quotations now are 20¾c. for Straits, 21c. for Malacca, and 21⅛c. cash for Australian.

Lead.—The dead-lock still continues. Holders ask 4·60c for Common, and the majority of buyers decline to touch lead at more than 4·50c., only one buyer offering to take a 100-ton lot at 4·55c. Refined lead is vainly offered at 4·60c.

Messrs. John Wahl & Co., of St. Louis, wire us as follows to-day :

The market remains about the same ; if any thing, a shade weaker. Sales will not aggregate 270 tons of Refined lead at 4·22½c., and 170 tons of Hard lead at 4·15@4·19c.

St. Louis is, therefore, slightly better than this market.

Spelter.—The market here is dull, and business is restricted to occasional car-lots at special figures. Ordinary Western is still offered here at 4·57c. Some of the producers decline to sell at these figures. It is maintained by some that the signs of an early change for the better are becoming visible.

Antimony.—Very little has been done, the metal weakening further. We quote nominally, 10c. for Hallett's, and 11c. for Cookson's.

Quicksilver.—We remark an active export demand, which is consuming all the local product and the old stock of 2000 flasks held by one house for two years or more. The spot price is 34½@34¾c.—*San Francisco Commercial Herald.*

COAL TRADE REVIEW.

NEW YORK, Friday Evening, Feb. 23.

Anthracite.

The anthracite coal trade is dull and lifeless and is decidedly in buyers' favor. There is very little of interest to report, except that one company found it necessary, in order to move coal afloat, the bulk of it being stove and egg, to make a concession on the price. This, we understand, was, however, only temporary, and is not now, so far as we can learn, continued.

Mr. John H. Jones, official accountant, has issued the following statement of the anthracite coal tonnage for the month of January, 1883, compared with the same period last year :

	January, 1883.	January, 1882.	Differ'ce.
Philadelphia & Reading RR.	465,510	408,367	+57,143
Lehigh Valley RR	*431,577	359,216	+72,361
Central RR. of N. J.	304,483	264,291	+40,191
Del., Lack. & W. RR.	338,260	291,514	+46,746
Del. & Hud. Canal Co.	†247,725	222,400	+25,324
Pennsylvania RR.	161,858	165,992	− 4,134
Penna. Coal Co.	102,753	96,185	+ 6,567
N. Y., L. E. & W. RR	23,573	25,942	− 2,369
Total	2,075,741	1,833,910	+241,831

*This amount includes the production of the mines of the State Line and Sullivan RR. Co., amounting to 7,318 17 tons.

†In addition there were 33,261 tons transported from mines by the D. & H. C. Co., which is included in tonnage other interests.

The stock of coal on hand at tide-water shipping points, January 31st, 1883, was 616,759 tons ; on December 31st, 1882, 562,116 tons ; increase, 54,643 tons.

Bituminous.

For current business, the trade is exceedingly dull and quiet, and what movement there is is confined to deliveries on old contracts. We understand that the first contract of the season, 75,000 tons to the Eastern Railroad, has practically been closed at a low figure. This is doubted in some quarters, because complications have arisen between the Baltimore & Ohio Railroad and the Pennsylvania Railroad, in regard to the freight rates from the Cumberland and Clearfield regions. It seems that by some misapprehension the Baltimore & Ohio rates were computed on the distance from Piedmont instead of from Cumberland, thus giving shippers of Cumberland coal over the Baltimore & Ohio Railroad an advantage of 23 cents over their competitors shipping Cumberland coal via the Pennsylvania system and the shippers of Clearfield coal. It is understood that the matter is under investigation now. We quote for current business unchanged, $4.50 @$4.60 alongside for Clearfield ; and $4.55@$4.75 for Cumberland.

STATISTICS OF COAL PRODUCTION.

Comparative statement of the production of anthracite coal for the week ended February 17th, and year from January 1st :

TONS OF 2240 LBS.	1883. Week.	1883. Year.	1882. Week.	1882. Year.
Wyoming Region.				
D. & H. Canal Co.	42,395	408,573	46,718	373,360
D. L. & W. RR. Co.	71,814	520,083	63,380	470,048
Penna. Coal Co.	20,301	145,518	14,096	111,555
L. V. RR. Co.	10,840	117,164	12,910	125,484
P. & N. Y. RR. Co.	2,637	22,815	3,117	21,159
N. RR. of N. J	45,521	265,856	53,042	253,394
North & West Br. RR.	11,703	63,171	.....	.....
	205,211	1,543,180	193,272	1,355,000
Lehigh Region.				
L. V. RR. Co.	53,137	527,292	63,617	455,316
N. RR. of N. J.	39,445	238,720	29,236	215,513
S. H. & W. B. RR.	.....	2,475	.....	1,223
	92,582	768,487	92,853	672,052
Schuylkill Region.				
P. & R. RR. Co	85,569	719,077	96,384	658,200
Shamokin & Lykens Val.	24,548	146,102	19,029	151,032
	110,117	865,179	115,413	809,232
Sullivan Region.				
State Line & Sul. RR. Co.	831	8,181	1,382	6,274
Total	408,741	3,185,027	402,920	2,842,558
Increase	.....	342,469	.....	.....
Decrease	.....	.....	.....	.....

The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

Total same time in 1878	2,819,392 tons.
" " " " 1879	2,562,750 "
" " " " 1880	2,620,529 "
" " " " 1881	3,014,453 "

The decrease in shipments of Cumberland Coal over the Cumberland Branch and Cumberland & Pennsylvania railroads amounts to 74,816 tons, as compared with the corresponding period in 1882.

Belvidere-Delaware Railroad Report for the week ended February 17th :

	Week.	Year. 1883.	Year. 1882.
Coal for shipment at Coal Port (Trenton)	....	125	.....
Coal for shipment at South Amboy	13,895	98,129	86,819
Coal for distribution	15,114	104,555	83,344
Coal for company's use	3,340	19,207	18,159
Total	32,349	222,016	188,322
Increase	.....	33,694	.....
Decrease	.....	.....	.....

The Production of Bituminous Coal for the week ended February 17th was as follows :

Tons of 2000 lbs., unless otherwise designated.

	Week. Tons.	Year. Tons.
Cumberland Region, Md.		
Tons of 2240 lbs.	40,060	222,051
Barclay Region, Pa.		
Barclay RR., tons of 2240 lbs.	4,963	48,588
Broad Top Region, Pa.		
Huntingdon & Broad Top RR	6,855	33,893
East Broad Top	828	8,106
Clearfield Region, Pa.		
Snow Shoe	5,470	39,296
Tyrone and Clearfield	57,576	349,389
Alleghany Region, Pa.		
Pennsylvania RR.	8,792	90,457
Pittsburg Region, Pa.		
West Penn RR.	11,217	68,790
Southwest Penn. RR.	2,852	18,787
Penn & Westmoreland gas-coal, Pa. RR	36,760	189,938
Pennsylvania RR.	10,366	69,343
Total	185,569	1,138,638

The Transportation of Coke over the Pennsylvania Railroad for the week ended February 17th and year from January 1st :

Tons of 2000 lbs.	Week.	Year.
Penn. RR. (Alleghany Region)	2,149	15,948
West Penn. RR	3,025	14,407
Southwest Penn. RR	33,963	262,576
Penn. & Westmoreland Region, Pa. RR	2,474	35,048
Pittsburg, Penn. RR.	71	151
Snow Shoe (Clearfield Region)	255	1,150
Total	41,937	329,280

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